THE
OPERATIVE SURGERY
OF
MALIGNANT DISEASE

BUTLIN

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ON
THE OPERATIVE SURGERY
OF
MALIGNANT DISEASE

BY

HENRY T. BUTLIN, F.R.C.S.
ASSISTANT SURGEON AND DEMONSTRATOR OF SURGERY, ST. BARTHOLOMEW'S HOSPITAL
LATE ERASMUS WILSON PROFESSOR OF PATHOLOGY TO THE
ROYAL COLLEGE OF SURGEONS

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TO

SIR JAMES PAGET, BART.,

F.R.S., D.C.L., LL.D.,

This Volume is Dedicated,

IN GRATITUDE FOR HIS INSTRUCTION WHILE A STUDENT,

FOR MANY ACTS OF KINDNESS AND ENCOURAGEMENT

SINCE THE PERIOD OF STUDENT LIFE,

AND, CHIEFLY, FOR HIS ILLUSTRIOUS EXAMPLE

IN PUBLIC AND IN PRIVATE LIFE.

PREFACE.

At the end of two years, during which all my leisure has been devoted to this work, I venture to issue it to the Profession, not because it is complete, but because it is as complete as my means of information and knowledge have permitted me to make it in the time which has been given to it. And if I am asked why I did not devote a longer time to the collection of material, and thus render some of the chapters far more complete than they are at present, my answer must be that a book of this particular character should not occupy too long in the making, lest some parts of it should fall behind the times and be old when the book is yet new. At the best, it can only offer a faithful reflection of the relation of surgery to cancer at the moment at which it is written, and I cannot hope that it will occupy a lasting place in the literature of the subject.

But I do hope that it may attain one or other, or all, of the following ends:—

> Indicate the class of cases and the parts of the body which may be treated by operative means with the best prospect of success.
>
> Encourage the performance of operations in suitable cases at the earliest possible period.

Discourage the repetition of useless and dangerous operations.

Raise the question of the propriety of the removal of entire organs for the cure of cancers of limited extent.

And with this hope I part from it.

82 Harley Street, W.
August 1887.

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THE
OPERATIVE SURGERY
OF MALIGNANT DISEASE.

CHAPTER I.

INTRODUCTION.

In the following pages I have tried to give as clear and precise an account as possible of the present relations which operative surgery bears to malignant disease. For a long time past I have felt that this work of review ought to be undertaken. First, because I am sure that the good results of operations for malignant disease have been underrated in some quarters; second, because I feel equally sure that there has been a tendency to carry operative surgery to an unjustifiable length in other quarters. It is therefore of the highest importance that we should be in possession of as complete information as we can obtain of the results of operations for malignant disease; and that we should make some attempt to formulate our practice in accordance with this information. The reasons which have led me personally to undertake so large and difficult a task are the great interest which I have for many years taken in the subject of malignant disease, the material which was already in my possession, and the knowledge of the sources from which much more material might be derived. I have undertaken it with a full appreciation of its difficulty and importance, and am quite aware how distressingly it falls short in many respects of what it ought to be. This is, of course, in part my own fault; but it is not wholly my fault. For there is a great lack of the information which is necessary to make such a work as this perfect. Only within the last few years has there been a disposition (on anything like a large scale) on the part of operating surgeons to keep their cases of malignant disease under observation sufficiently long to discover how far the operations have had the effect of delaying the course of the disease or of completely arresting it. Mr. Hutchinson published in the *Medical Times and Gazette* in 1860 long and carefully prepared lists of cases of cancerous disease of various parts of the body. These tables justly received a large share of attention, and obtained for their author the praise which he deserved; but it is very disappointing to see how many of the cases are incomplete, and in how few of them the period of observation, after the last operation, was maintained sufficiently long to enable a correct opinion to be formed of the success of the treatment. During the last twelve years several excellent and most successful efforts have been made to supply these defects in our knowledge by the addition to surgical literature of such works as von Winiwarter's *Beiträge zur Statistik der Carcinome*, Volkmann's *Beiträge zur Chirurgie*, and others of a similar character dealing with operations on individual organs. None of these works pretends to be complete so far as the operative treatment of malignant disease is concerned. Indeed, in so far as the tables are gathered from cases treated for the most part by individual surgeons or in particular clinics, the number of cases of malignant disease of many parts of the body is not sufficiently large, while other parts have been left out of consideration. This work, then, is intended to fill, so far as it is possible at the present moment, the gap in our surgical literature.

In accordance with the views which I expressed several years ago in regard to the vast difference which exists in the degree and kind of malignancy of malignant tumours according to their seat of origin—*Malignant Disease of the Larynx*, p. 4 (1883)—I consider it essential that the malignant diseases of each tissue and organ should be considered separately. And, in the study of the results of operations, it is sometimes needful to consider them separately in reference to the varieties of malignant disease which affect the tissue or organ in question.

In actual practice it is necessary to take even a more comprehensive view of malignant disease than this. Not only is there a vast difference between the possible course and effects of similar varieties of malignant disease in different parts of the body, but there is often almost as great a difference in the course and effects of tumours of similar structure arising in the same part of the body and apparently in precisely similar conditions. It is too much the custom to regard every individual case of cancer (and I use the word in its largest signification, as applying to every kind of malignant tumour) simply as a case of cancer, to which an operation is possible or not according to its situation and extent, and to found the prognosis of the individual case on our general knowledge of the most common course of cancer, either of every part of the body, or of the particular part which happens to be its seat. But this is a very imperfect view of the subject, and one which has led in some instances to a practice which is wholly undesirable.

In a certain sense, indeed, every surgeon is influenced in his prognosis and in deciding on operation by the course which the individual case of cancer has pursued up to the period at which the question of operation is laid before him. Take as an example cancer of the breast. If the tumour has in the course of six months from its commencement attained a very large size, if it is adherent to the skin and to the pectoral muscle, and if the axillary glands are already affected, the surgeon may consent to operate, but he does so with the full conviction of the small prospect of permanent relief afforded by the operation. The rapidly progressive cases are usually thoroughly appreciated. But there are other cases of cancer of the breast in which the disease runs a singularly chronic course. The tumour in many of these cases has the same consistence, the same naked-eye characteristics, the same structure when examined with the microscope, as the tumour in the rapidly progressive case, yet it grows at the slowest possible rate, fails to affect the glands at the end of four years or more, produces no secondary growths in distant organs and tissues even after the lapse of several or many years. And between these extremes there are tumours of all intermediate degrees of malignancy. All of them, whether quick growing or slow growing, have the same tendency, namely, to kill; and all of them tend to pursue a similar if not identical course—to infiltrate the tissues of the breast and the adjacent structures, to affect the lymphatic glands, and to reproduce their kind in distant tissues and organs. But the manner and the rapidity with which each individual cancer performs what we may term its allotted task are liable to the widest variation.

Let it be clearly understood I have not been speaking of different varieties of cancer, or comparing a medullary with a withering scirrhous cancer, but have been speaking of what may be called the ordinary hard cancer of the breast. Between the tumours which pursue so widely different a course not even a microscopic difference can be distinguished.

Now, these cancers of slow course and less malignancy are not sufficiently recognized in their relation to the operative surgery of malignant disease, yet they explain a curious exception to one of the greatest laws which we have hitherto formulated for the surgery of cancer.

That THE EARLIER A CANCER IS REMOVED SO MUCH THE MORE LIKELY IS THE OPERATION TO BE PERMANENTLY SUCCESSFUL is a general law to which almost every surgeon will assent. Yet it is nevertheless true that some of the most successful operations are those in which the removal of the disease has for some reason been deferred until it has been in existence for a much longer period than would cover the whole course of most cases of the same variety of cancer in that part of the body. Many of the chapters offer examples of these apparent exceptions to the advantages of early operation, and particularly the chapters on the Breast, the Penis, the Lower Lip. Such cases might be, and have been, I doubt not, often employed as an argument in favour of deferred operations. But, seen in their true light, they are merely evidences of very modified malignancy of individual tumours. Had the same tumours been removed at an earlier period, as brilliant results would have been produced by less formidable operations. Every week of delay has increased the danger of the contraction of serious adhesions, of affection of the lymphatic glands, and of the formation of secondary growths. Such cases as these afford the best prospect of permanent success from an operation, and yet I have known the advice given that, the course of the disease being so slow and the annoyance produced by the tumour so small, an operation was not desirable, and that, so far from being useful, it might set up more rapid growth and actually lead to the very catastrophe it is intended to avert.

On a knowledge of these cases I shall venture to formulate a proposition to the effect that WHEN LONG DURATION OF A MALIGNANT TUMOUR IS ASSOCIATED WITH VERY SLOW PROGRESS, SMALL SIZE, ABSENCE OF SERIOUS ADHESIONS, ABSENCE OF AFFECTION OF

THE NEIGHBOURING LYMPHATIC GLANDS AND OF SECONDARY GROWTHS, SO MUCH THE MORE FAVOURABLE IS THE PROSPECT OF PERMANENT RELIEF FROM OPERATION FOR ITS REMOVAL. It may be said that the withering scirrhous cancers of the breast offer an exception to this rule, but that is not the case. For even when they are of small size and are not associated with affection of the lymphatic glands, they nevertheless form serious adhesions at a comparatively early period, and in their progress become so intimately adherent to the surrounding textures that their removal is practically impossible.

With the full recognition of the immense advantages of early operation in cases of malignant disease, it may be wondered why operations are in so many instances delayed to a late period of the disease, when the tumour has contracted serious adhesions and is already associated with secondary affection of the lymphatic glands. I believe that the responsibility rests in the large majority of instances with the patient. There are of course instances in which the medical attendant is to blame, either because he has failed to make the diagnosis sufficiently early or because he has advised delay. And there are other instances in which the disease has been completely overlooked until it has obtained so strong a hold that it cannot be successfully treated by operation. But in a large number of cases of external cancer, the existence of the disease is kept secret by the patient, or an operation is refused until the disease is advanced and has forced the patients to submit by signs which cannot be mistaken. It is not probable that we shall ever attain to such a state of things that this reluctance to submit to operation will be completely overcome, especially when we know how little we can promise to our patients from an operation in many cases of cancer. But it is probable that a greater number of patients will be disposed to submit to early operation in the future than formerly. For surgery has made immense strides during the last fifteen years, not only in diminishing the mortality after many operations, but in rendering convalescence from operations rapid and free from pain. To antiseptic surgery this result is largely due, and even those of us who do not employ the actual antiseptic methods of Lister yet gratefully acknowledge the marvellous effect which his teaching has produced, directly and indirectly, on modern surgery. The certainty of far less risk to life and of far less pain and misery will assuredly lead patients to seek the benefit, whether temporary or permanent, which may be obtained by operation; the ease and safety with which many operations can now be performed will lead medical men to advise and undertake operations at the earliest possible period at which the diagnosis can be made. We may therefore look forward with confidence to far better statistics from the operative treatment of cancer than the following pages will exhibit.

But there is another result of the improved conditions of modern surgery which is, to my mind, wholly undesirable, and which may do much to counterbalance the good which may be expected from it so far as the operative treatment of malignant disease is concerned. The ease and the comparative safety with which deep-seated structures and internal organs can be dealt with in the present day has led surgeons to practise operations for the removal of malignant disease of parts of the body which were until a few years ago considered inaccessible to surgery. I am far from saying that we are not justified in carrying the operative surgery of malignant disease farther than we formerly might do. But I do say, and shall endeavour to maintain, that the operative surgery of malignant disease has of late years been pushed beyond its reasonable limits, and that we are in danger, on this account, of drawing down on ourselves well-merited censure.

There are two directions in which this fault is apparent. The first, and by far the less serious, of the two is the performance of operations which are far more severe than the individual cancer calls for. The second, and by far the more important, is the extension of operative surgery to the cancers of parts of the body which can only be removed with the gravest danger to the patient.

Under the first head fall the removal of entire organs for cancers of small extent limited to a segment of the organ, and the removal of the neighbouring lymphatic glands as a necessary accompaniment of the removal of the primary tumour, even when they cannot be discerned to be enlarged by the closest scrutiny at the time of the operation. As these questions will be referred to in several of the chapters, particularly in those on the Breast, the Lower Lip, Penis, Uterus, Vulva, &c., only the main principles on which they rest will be discussed in the Introduction.

Of the desirability, nay, the necessity, of the complete removal of some organs when an operation is undertaken for malignant disease there can be no question. Examples of such organs may be given in the eye and testis, which are of such a kind and so affected by cancer that the question scarcely ever arises of their part removal. But there are other organs, such as the breast, the tongue, and uterus, in which it is of the utmost importance that we should review the question of complete removal, and endeavour to arrive at a definite conclusion of the best course to pursue in the future. I am not aware that any person has brought forward a deliberate proposal that every operation for the removal of cancer of the tongue should embrace the entire removal of the organ, and yet I believe there are as good grounds for such a practice as for the entire removal of the breast and uterus for cancer. The question of the complete removal of these organs will be dealt with fully in the chapters devoted to them, but I may here say that such good reasons have during the last three years been shown against the complete removal of the uterus for the treatment of cancer of the vaginal portion (see p. 330) that the major operation cannot any longer be justified. The removal of the entire breast in every instance is much more difficult to attack successfully, on account of the constancy with which the operation is performed, the fact that so many of us have been trained in the practice from the commencement of our surgical studies, and the consequent difficulty of bringing forward such evidence as shall suffice conclusively to prove that the reasons against it are stronger than those which can be adduced in favour of it. It has been often said that the breast must not be compared with such organs as the tongue and uterus, on account of the great difference which exists in the general structure and arrangement of these parts. I can only say that each of them is composed of numerous glandular structures, contained in connective tissue, and covered with skin or mucous membrane. The tongue and uterus contain a large amount of muscular tissue, while the breast contains only small quantities of unstriped muscle. The glands of the tongue and uterus are probably less closely connected with each other than are the acini of the breast; but the acini of the breast are not all connected with one main duct, and the several lobes and lobules of which the gland is composed are as separate from each other as the separate glands of the tongue and uterus. If entire organs are to be removed for cancer on account of general similarity and continuity of their structure, there are no organs or tissues to which this practice should apply with greater force than to the muscles and the bones. With regard to the muscles, the number of instances of malignant disease on record which throw light on the results, or probable results, of the removal of the entire muscle for malignant disease limited to a part of it is so small and imperfect that no opportunity is afforded of judging the question from the results of actual practice. But with regard to the bones the case is very different. The sarcomas of central origin, which arise in the interior and in the very substance of the bone, which are not limited by any membrane or capsule, and are therefore not separated from the central cavity and its contents, are decidedly less malignant than the sarcomas of sub-periosteal origin. The chapter on the Bones will afford many instances of resection (of portions of the lower jaw) and amputation (of the forearm) in which much of the continuity of the affected bone has been left behind, and yet an admirable result has been obtained. In the recurrence of the sarcomas of the bones, whether central or sub-periosteal, the new growth as frequently appears in the soft parts of the limb (muscles, fasciæ, &c.) as in the bone itself. Can there be a clearer proof of the absence of necessity of removing entire organs than such facts as these? If it be said that the reason for making an exception in the case of certain organs (as the breast) is that they are only affected by cancer when they are in a degenerate condition, and are, in fact, in some curious manner predisposed to cancer, the same arguments may be applied to the bones. The particular portion of the bone must have been "prepared" for the development of the sarcoma; and if only a limited portion of a long bone is prepared for the occurrence of malignant disease, why not a limited portion of such an organ as the breast? I might bring forward the lower lip as an admirable example of a part of the body which is peculiarly subject to cancer, and from which the cancer and the adjacent tissues only are removed with the best success. I am told that there is no analogy between the lower lip and such an organ as the breast. I fail to see the essential difference in so far as the relation of the two parts to cancer is concerned. If the argument of the general tendency of an organ or tissue to cancer—in other words, its preparation for cancer—is admitted as a justification of the necessity of its complete removal, this argument may be used with perfect propriety in the treatment of cancers of the lip, and the necessity may be urged for the complete removal of the whole of the prolabium and adjacent integument in every case of epithelioma, however limited in extent. For Thiersch long since pointed out the degenerate condition of the tissues of the lower lip, and the consequent tendency to cancer, or preparation for it, in old people. There are cases on record, quite as many as can be shown for the breast, of the occurrence of a second epithelioma in another part of a lower lip from which an epithelioma was removed years previously. If, because the patient has already exhibited a predisposition to the disease, we are to undertake the removal of all parts of the body which may in time become cancerous, we shall have more than enough to do. By all means let us remove the earliest indications of cancer in such people whenever we can distinguish them, but let us rest there.

It must not be supposed, because I object to those operations which extend of necessity to the removal of whole organs, that I am an enemy to free and thorough operations for malignant disease. On the contrary, I hold to the full extent the truth of the great general proposition, which may stand side by side with the law of "early" operation, that THE MORE FREELY A CANCER IS REMOVED THE MORE LIKELY IS THE OPERATION TO BE PERMANENTLY SUCCESSFUL. And I hold also to the full extent the necessity for the removal of a wide area of the surrounding apparently healthy tissues in every instance in which it is practicable. But I am sure that, in the practice of many surgeons, the performance of a "set" operation, such as the complete removal of an organ, more often leads to incomplete than to complete removal of the disease itself. They are so intent on the complete removal of *the organ*, that the very free removal of *the tumour* becomes a secondary consideration, and I have frequently seen the narrowest area of apparently healthy tissue removed on one side of a tumour while several inches of healthy tissues were removed on the other side.

Of the necessity of the dissection of the neighbouring lymphatic glands as an accompaniment of the removal of the primary disease in certain parts of the body much has of late been written. Forcible arguments have been brought forward in favour of the practice, but I think even more can be said against it. It has been applied more particularly to the glands beneath the jaw in connection with cancer of the lower lip and tongue, to the axillary glands in connection with cancer of the breast, to the groin glands in connection with cancer of the penis, the vulva, and vagina. The cases which have led to it are those in which, within a few weeks or months of the removal of the primary disease, the neighbouring lymphatic glands have become enlarged and cancerous without any recurrence of the primary disease. That such cases do occur there can be no question, but their number and importance have been largely exaggerated. It has been assumed, and probably correctly assumed, that the lymphatic glands, in such cases, were already affected with cancer at the time of the removal of the primary disease, but that they had not then attained a sufficiently large size to be distinguished through the overlying tissues. In so far, therefore, as it is not possible in every instance to be sure of the condition of the lymphatic glands, it is well to remove all the glands which can be discovered at the time of the removal of such primary cancers as are habitually associated with glandular affection. If they are diseased, the sooner they are removed the better; if they are not diseased, at least little or no harm is done.

Up to the present time, no evidence has been brought forward in favour of this practice which carries conviction with it. I am not aware of any statistics which are so arranged as to place its advantages clearly before the profession. I know well the statistics of Gross and Banks in reference to operations on the breast, and the paper of Gussenbauer, on the development of secondary glandular tumours, in the second volume of the *Zeitschrift für Heilkunde* (p. 17), and other tables and papers on the subject. And I have been astonished to see the large number of instances in which Gussenbauer discovered cancerous affection of the glands in association with primary cancer of the lip, and to compare the results of his minute examination with the results of actual practice. Actual practice and what may be termed experiment on the human subject teach us that the most successful operations for the removal of cancer are those which are performed for cancer of the lower lip; that the prospect of cure by operation is about 50 per cent. when the operation is performed before there is any visible or palpable enlargement of the glands. The glands have not been removed in these cases, because they have not been obviously diseased. And yet Gussenbauer has found microscopic evidence of cancerous affection in no fewer than twenty-nine out of thirty-two cases, and doubtful evidence in the remaining three cases. Gussenbauer's experience in this respect has been quoted and made use of as an argument in favour of exploratory operations in lymphatic glandular regions in all instances in which glandular affection is apt to be associated with the primary disease, but there is no clearer evidence than is afforded by his researches that the results of microscopic examination must not be allowed to outweigh clinical experience and common-sense. If Professor Gussenbauer's researches are correct, the lymphatic glands ought to become enlarged in the very large majority of the cases in which primary cancer of the lip has been removed, whether there has been local recurrence of the disease or not. But they have only become enlarged (in the absence of recurrence *in sitû*) in a very small minority of the cases, and on this account the practice of not removing them is clearly justified.

The objections which I take to the practice are two. First, the operations for the removal of enlarged glands or glands which are supposed to be diseased are usually difficult and often dangerous, and they add something (in the case of certain primary cancers, a good deal) to the danger of the operation. The increase of mortality when the glands beneath the jaw are dissected out is probably very small, but no surgeon will deny that the removal of the axillary glands adds decidedly to the danger of operations for the removal of cancer of the breast. Second, there is the strong probability of leaving behind some of the glands when they are so small that there is no obvious disease, and the probability that the operation may on this account prove futile.

Once more I hope it will not be supposed that I am dissuading from operations for the removal of the glands when they are enlarged and there is a reasonable prospect of their safe removal. I go so far as to recommend, and to practise myself, the examination and removal of the glands in every instance in which there is not only a decided increase in their size, but what is often termed some doubtful fulness in the glandular region. But, before I become a convert to the more active measure, I must have before me evidence of a much more conclusive character than any which has been hitherto published. It is not sufficient to say that every cancer of the breast, the lower lip, the penis, vulva, &c., will affect the lymphatic glands, and that the glands must therefore be removed. We must have before us comparative statistics to show the number of instances in which, after careful examination at the time of the removal of the primary disease, not the slightest enlargement of the lymphatic glands could be discovered, and in which they became affected after the operation without any return of the disease *in sitû*, and of the cases in which apparently healthy glands were dissected out at the time of the removal of the primary disease, and the proportion of them in which the glands became affected at a later period, either with or without recurrence of the primary disease. Banks's statistics, to which reference will be made in the chapter on the Breast, offer no information on this point, and yet it is a point of the greatest importance. Many of the sections will show what a vast difference there is between the results afforded by cases in which operations have been performed before the glands have become affected and those in which the operations have been deferred until the glands have become obviously affected. Because the cancers of certain organs and tissues tend to affect the lymphatic glands at an earlier or later period, it is a grave error, and to my mind a piece of rough and blundering surgery, to treat every individual case of cancer of those parts as if the glands were already affected. When we know that, in not a few instances, the glands have not become affected until after the lapse of from four to ten years after the appearance and slow progress of the primary disease, why should we insist on the dissection of the glands in every instance of slowly progressing cancer, whether they can be felt to be enlarged or not? Such treatment is a kind of punishment of the innocent with the guilty: it is to condemn every woman who has the good fortune or the good sense to apply for treatment of a mildly malignant cancer at a very early period of the disease as if she were suffering from one of the more malignant cancers, or had deferred the operation until a late period, when the prospects of success are largely diminished.

Before I leave this question of the treatment of the lymphatic glands, there is one more point in connection with it to which reference must be made. It is the probable condition and appropriate treatment of the lymphatic vessels which connect the seat of the primary disease with the neighbouring lymphatic glands. It appears to have been assumed by the advocates of the more severe methods of treatment that no operation for the removal of the glands is complete which does not include the removal of these vessels. And, for this purpose, wherever such a proceeding is feasible, the intervening tissues which contain the lymphatic vessels must be removed. There still is, and probably for a long time will be, a great difference of opinion regarding the condition of the lymphatic vessels. Gussenbauer found that long cords of cancerous material connect the primary disease with the lymphatic glands, and that these cords lie close to, but are not formed in, the interior of the lymphatic vessels. Hoggan found the lymphatic vessels plugged with cancerous material from the seat of the primary disease up to and even beyond the neighbouring lymphatic glands (*Pathological Transactions*, xxix. 384, 1878), and other observers have found that the actual cellular elements of the walls of the lymphatic vessels become converted into cancer cells. And on the strength of his observations, which were limited to the examination of a single case of cancer of the skin, Dr. Hoggan drew large and important conclusions, and intimated that the recurrence of cancerous disease after operations depends in large measure on the neglect of surgeons in not removing the lymphatic vessels. This, again, is an instance in which imperfect microscopical observations have been employed to set surgery straight. If we look into the actual clinical facts, and appeal to the experience derived from practice, we shall find that there is scarcely any evidence to prove that recurrent disease has depended on the leaving behind lymphatic vessels which have contained the elements of cancer. After operations on the breast, the recurrence takes place in the immediate neighbourhood of the scar, and, if the breast and glands have been removed, either in the situation of the primary cancer or the lymphatic glands, or both, but scarcely ever in the intervening space where the lymphatic vessels lie. After the removal of the testis, recurrence in the stump or in any part of the cord is comparatively rare, unless the cord was obviously diseased at the time of the operation; but it is by no means rare to observe affection of the lymphatic glands in the pelvis and abdomen slowly develop within a few weeks or months of the removal of the primary disease. That the lymphatic vessels of the cord conveyed the material which produced the development of cancer in the glands there can be no doubt, but the evidence of practice is strongly opposed to the view that the lymphatic vessels were actually themselves diseased or plugged with cancer elements. I say nothing of the numerous failures which have been recorded by competent microscopists of attempts to discover any decided elements of cancer in the lymphatic vessels.

In practice I would say that, if firm cords can be felt between the primary disease and enlarged glands, and the operation is extended to the removal of the glands, the intervening cords should also be removed. But I certainly should not go farther than this.

And now with regard to the second and far graver question of the extension of operative surgery to the cancers of parts of the body which can only be removed with the gravest danger to the patient.

The improvements which have been effected in operative surgery, particularly in the treatment of operation wounds, have rendered it possible for surgeons to operate on organs and tissues which were, until a few years ago, completely shut in from the attacks of the surgeon. The impunity with which these parts may now be dealt with in the treatment of inflammatory affections, cysts, and innocent tumours has led to the introduction of surgical attempts on malignant tumours which are open to the gravest objection. With a very limited knowledge, in many instances, of the natural course and capabilities of a malignant disease, the determination has been arrived at to treat it by operation; and the fact that experiments on animals have proved that they can live when deprived of the part in which the tumour is situated has been held to be a sufficient justification for its removal from the human subject. The effect is no other than might reasonably be expected. For one of these new and brilliant operations for cancer which is likely to gain a sure position in surgery there are many which are likely to be held up as a lasting record of the lengths to which surgery was pushed in the eighth and ninth decades of the nineteenth century. The records of some of these operations are positively ghastly. Battles, shipwrecks, and railway accidents are mild and merciful compared with some of these achievements of modern surgery. Sixty-five cases of complete extirpation of the larynx for carcinoma, with thirty deaths due to the operation! Six cases of œsophagectomy, with three deaths! Forty patients for whom malignant tumours of the kidney were removed, with twenty-eight deaths! (Gross). One hundred and forty-eight cases of removal of the uterus through the abdominal incision, with 106 deaths!! Fifty removals of cancerous thyroids, with thirty deaths!! Fifty-five patients for whom cancer of the pylorus was removed, of whom forty-one died!! Here are the records of surgical operations on six parts of the body. The total number of cases is 364, with 126 recoveries and 238 deaths due to operation! Truly an awful mortality!!

Still, it may be said that the 238 persons who perished of the operations were in any case doomed to death within a short period, and that so large a mortality is more than justified by the cure of 126 persons who must have died but for the operations. Is this so? Of the cases of carcinoma of the larynx, only seven patients were alive and well more than a year after the operation, and only one of the seven more than two years. Of the three patients who survived the operation of œsophagectomy, two were known to have died of recurrence of the disease, and the third was lost sight of. Of the recoveries from removal of the kidney, only one appears to have been permanent, the others having been followed speedily by recurrence of the disease (Gross).. Of the cases of abdominal removal of the uterus, Gusserow says that all the patients whose history has been followed up suffered from recurrence of the disease. Of sixteen patients of the twenty who recovered from the operation of removal of the thyroid, only two survived the operation for more than a year. Of the thirteen patients who were known to have recovered from excision of the pylorus, ten suffered from recurrence of the disease, and not one is known to have made a permanent recovery. Yet this same operation of removal of the cancerous pylorus was described, when first it was performed by Billroth, as an epoch-making operation.

On several occasions I have been informed that it is premature to express an opinion on these and similar operations; that this work is merely the work of the pioneers of surgery; that a better acquaintance with the characters of the malignant diseases of these regions of the body will enable operators to deal with them more successfully; that improved technik will diminish the mortality of the operations. And more than once attention has been drawn to the immense improvements which have taken place in abdominal surgery, and particularly in the statistics of ovarian operations. It has been said that ovariotomy was, in its infancy, a very fatal operation—so fatal that it was regarded by many distinguished surgeons and obstetricians as unjustifiable, and was on that account for a long time abandoned. To this my reply is, that the operation of ovariotomy (and I refer to this operation particularly on account of the use which has been made of it, and as the representative of a class of operations) differs in every respect from these operations for the removal of malignant disease, even from those of them which have been practised on the abdomen. In the first place, the difficulties in dealing with the abdomen *have been* overcome, and the time has passed when the mere opening of the peritoneal cavity and prolonged manipulation of its contents is regarded as one of the most serious operations in surgery. And the general technik of operations and the management of patients after operations have been already so much improved during the last fifteen years that there is now no longer the same prospect as formerly that improved technik will revolutionize the statistics of surgical operations. Many of these new operations have been performed by admirable manipulators, careful antiseptic surgeons, men accustomed to deal frequently and successfully with the part of the body in question. Yet their results, although they are often decidedly better than the results of less experienced operators, are most unfavourable. Compared with the mortality of operations for ovarian cysts and other non-malignant diseases, the results of the operations for malignant tumours are distressingly bad. But this is not all. When a woman has successfully undergone the operation for the removal of an ovarian cyst, she does not merely recover from the operation with the expectation of speedily succumbing to a relapse of the disease. She is cured; and her cure is lasting. How often will this be the case after operations for malignant disease of the pylorus, the kidney, the thyroid, the larynx, the œsophagus, the body of the uterus? For ages we have been removing cancer of the penis, the limbs, the testis—parts of the body seemingly so well suited for successful operations that the most hopeful prospects might fairly be held out to our patients of complete cure. Yet which of us is there who will dare to say of any individual case, however suitable it may appear for a radical operation, that the patient will be cured by the operation? The best we can at present say is that a certain percentage of complete recoveries takes place; how small is shown, alas! in the following chapters. If the treatment of cancer by surgical operation is, under the most favourable circumstances, attended by so small a measure of success after repeated trials and in the best and most experienced hands, what hope is there that a larger measure of success will crown our operations for malignant disease when the operations have to be conducted under the most unfavourable conditions, in the midst of vital parts to which the disease is frequently adherent, in many instances long after the period during which it would be considered reasonable to operate on the cancers of external parts of the body?

One of the best hopes of operative surgery for malignant disease lies in very early operation, when the disease is very limited in extent, when the surrounding tissues are as yet scarcely or not at all involved, when there is no affection of the neighbouring lymphatic glands. But for these early operations early diagnosis is essential. And how does the question then stand between the cancers of parts of the body well situated for operation and the cancers of the thyroid, kidney, uterus, &c.? For most of these parts it is notoriously bad—so bad for the thyroid that some of the surgeons whose experience of diseases of the thyroid is largest acknowledge that there are no means by which the malignant diseases can be distinguished from the non-malignant until they are already beyond the reach of operation. Nor is there any reasonable prospect that the diagnosis of the cancers of these more deeply seated organs will ever be as easy and certain as that of the cancers of the external parts.

At the best, it appears certain that the prospects of the operative surgery of these badly situated parts, so far as the complete cure of the patient is concerned, is never likely to be so good as for the external parts. That being so, the question of the advisability of very fatal operations for their removal may be put in a somewhat different fashion, and operators may well be asked whether they would submit their patients to operations of the same mortality for the relief of cancers of the external parts. I venture to think that the answer of prudent surgeons would be that such operations should only be practised in exceptional instances, in which the disease is so situated as to cause extreme distress, and from which it can be removed with a very good prospect of preventing recurrence *in situ*. In how many of these new operations can this promise be made?

There is another aspect from which these very fatal operations may be justified—on the ground, namely, that only by repeated trials can their mortality and inefficacy be proved. This cannot, however, be accepted as a justification in full. A careful study of the conditions of the disease itself in most of the parts of the body in question would have clearly shown the futility of an attempt to remove it unless under such favourable circumstances as can scarcely ever be obtained, and might have prevented the frequent repetition of useless and fatal operations. This is particularly true of the thyroid, the kidney, larynx, œsophagus, and body of the uterus. Of the pylorus it has been repeatedly proved that its removal when the disease is adherent to the surrounding structures, the pancreas and colon especially, is attended with a horrible mortality and with practically no prospect of permanent success. But this has not prevented operators from repeating the experiment again and again, with the same destruction of life. Of operations for the complete removal of the uterus I quite admit that the comparative mortality of removal through the vagina and through the abdomen could not well be discovered by any other means than a number of experiments on the human subject. But I do say that the operation of complete removal of the organ has been practised in a large number of instances in which partial removal ought to have been performed; and this solely on theoretical grounds, which are not borne out by a study of the course of the disease or by the results of operations.

I do not pretend to judge of what is a reasonable or justifiable mortality from an operation. Nor do I see how any rule can be laid down. A mortality which would be wholly unjustifiable under some circumstances might be more than justified under different circumstances, even when it resulted from the same or a precisely similar operation. For example, it would be more reasonable and justifiable to submit a patient to amputation of the leg for the removal of an incurable ulcer connected with necrosis of the bone, and associated with profuse suppuration which threatened amyloid disease, than it would be to amputate for old deformity which was merely unsightly and irksome, even if the mortality due to the operation was likely to be twice as great in the first as in the second case. I think it may be taken as a general rule that the smaller the probability of cure or permanent relief from an operation, the smaller ought the mortality from the operation to be. The larger the benefit to be expected from an operation, the greater the risk which may reasonably be incurred. Speaking generally, then, of operations for malignant disease, the risk incurred by the operation itself ought not to be large. For the probability of cure or permanent relief is comparatively small. A greater risk may certainly be incurred in the removal of those malignant diseases which are so situated that removal of the part, in addition to holding out a faint hope of cure, will almost certainly protect the patient from recurrence of the disease *in situ*, with its attendant distress. From this point of view, the amputation of the thigh at the hip-joint for central sarcoma of the femur may be justified, although the mortality due to the operation is very high. No such reasons as these justify the large mortality which is incurred in the operations which have been recently introduced. The prospect of cure or long relief is singularly small even under the most favourable circumstances. The mortality due to the operations should therefore be small, not large.

There is still one point of view from which these very fatal operations may be considered. The patients are doomed to death, and their course to death will certainly in many instances be attended with great suffering, which cannot be wholly or even in large part prevented by all the resources of surgery. What matters, then, their death? It is at least a release from pain and suffering, alike grateful to them and to their friends. Happier they who die under the knife than they who survive, for the first are permanently relieved of their distress! In other words, it is the "euthanasia" which is proposed, not merely the "euthanasia," but that surgeons should administer it by means of operation. By all means let us have the "euthanasia" if the sufferers themselves desire it, and if the State permits it. But not by means of operation. There are far more merciful and easier means of dealing death than this, means free from the previous anxiety, the distressing preparation, the pain immediately following many operations, the loathsome feeding, and the slow descent to death. With rapid and painless poisons, with anæsthetics, and with electricity at our disposal, there can be no excuse for the employment of methods comparatively so rough and brutal as great surgical operations. They have not even the recommendation of being certain in their effects.

It is very interesting and very instructive to study the origin and progress of the severe and extensive operations which have of late years been introduced into surgery, the theoretical considerations on which they have been practised, the influence of individual surgeons, the countries in which they have been most frequently performed. To pursue this investigation might, however, lead to strictures on individuals and to a comparison of national schools of surgery which might not be pleasantly received. I shall therefore content myself with saying that I am very pleased to find that, thus far, this country has furnished a very small number of these operations, and that we possess very few adherents of what might be regarded as the modern brilliant school of surgery. This work has been undertaken in part in the hope that it may prevent any further spread of what I regard as thoroughly unsound teaching in respect to the operative surgery of malignant disease, by placing the facts before the profession as clearly as possible. The necessity of such a warning may be appreciated by the perusal of a paragraph in the *Lancet* for 1886 (i. 220), headed "A Terrible Operation," which relates that a surgeon had recently performed a very large operation for the cure of a cancer of the breast. The removal included amputation of the breast, resection of a considerable portion of the second, third, and fourth ribs, clearing out the contents of the axilla, removal of half the clavicle, removal of the scapula, amputation of the whole of the upper extremity, and ligature of the subclavian artery and vein. The woman appears to have been a very strong person, for she survived the operation four hours.

I believe it may be laid down as a general rule, to which there are few exceptions, that, whether the SITUATION or the EXTENT of a malignant disease is considered, THE LARGER AND MORE DANGEROUS TO LIFE AN OPERATION, SO MUCH THE LESS LIKELY IS IT TO BE PERMANENTLY SUCCESSFUL. And the converse of this rule is almost equally true, namely, that the smaller and less dangerous operations are on the whole the most successful in completely curing the patients.

At the first sight these propositions may appear startling and even absurd. That they are not so, the reader may convince himself by comparing, with regard to *situation*, the relative mortality and more remote prospects of operations for malignant disease of the larynx, the thyroid, the œsophagus, the upper jaw, the body of the uterus, the kidney, and intestine, on the one hand, with those for malignant disease of the lower lip, the penis, the vulva, and the breast. The only notable exception appears to be the eye, especially when the operation is performed for glioma, for extirpation of the eye is scarcely at all dangerous to life, and the permanent successes are singularly few.

So far as the *extent* of the disease is concerned, very few surgeons will be disposed to deny that for cancers of nearly every, if not every, part of the body—for example, the lip, tongue, penis, scrotum, vulva, vagina, uterus, breast, bones—the more extensive the disease, and the more severe consequently the operation, the less likely is it to be successful. Large extent of malignant disease for the most part means long duration, or, worse, rapid course, and, in either case, a strong hold upon the patient. So much the less prospect, therefore, of preventing recurrence, so much the greater probability of affection of the lymphatic glands and other parts of the body. It is from early operations on suitable cases that the best results are obtained, when the removal of the disease is very thorough without involving an extensive operation. In the chapter on the Breast I have discussed the question of the desirability of performing operations in advanced cases, when there is scarcely any prospect of affording permanent relief, or even a long interval of respite from recurrence. I am not sure that we are not too ready to yield to what are often termed the dictates of humanity, and to practise sentimental rather than sound surgery. We are too much in the habit of yielding to the solicitations of the patient or the friends of the patient, and giving "a last chance" by operation in cases in which the operation has been for various reasons deferred till long after the period at which it would have afforded a reasonable or even a good prospect of success. It is, of course, much to the credit of surgeons that they should be guided so far by impulses which do honour to their kindly feelings, and by sympathy for the sufferings of their patients. But I am sure that the credit of surgery suffers by too great readiness to operate on hopeless cases. And I am not sure that, in the end, even patients suffering from malignant disease are not the worse for this humanity. To say nothing of the mortality and suffering which result from these extensive operations, the moral effect which is produced on the relations and friends of the sufferer, and on all who are acquainted with the case, by the immediate or very speedy failure of the operation, is such as to deter them from seeking surgical aid at the period when it might be useful. It is, of course, easy to say that no hope was entertained of permanent or even tolerably long relief from the operation. The explanation is not satisfactory to the laity, who are for the most part incapable of appreciating the sentiment which led the surgeon to perform so large an operation with so slender a prospect of success.

Were we to select our cases for operation with far greater care in the immediate future, to refuse to operate in cases in which the disease has formed important adhesions, or in which the glands are already affected (unless the affection is quite recent and comparatively insignificant), we should, I have no doubt, sacrifice a few persons who might have been saved by operation, but we should, on the other hand, largely diminish the number of our unsuccessful cases, which do so much to deter other persons from submitting to operation until they are driven to it; and both patients and their medical attendants would in time learn that, if they desire an operation, they must apply at an early period of the disease. I have no hope, and indeed no desire, that sentiment should find no place in surgery, but it has too often been allowed to exercise more than its due share of influence in the surgery of malignant disease.

The proposition of a much more careful selection of cases for operation than we have been in the habit of making leads me to speak of "the cancer-curers," the most successful of whom practise a rigid selection, because they are fully aware that their methods, when these consist in the application of caustics, are not suitable to advanced cases. Making every allowance for errors of diagnosis, owing to which tumours which are innocent are treated as though they were malignant, I cannot doubt that they really achieve a greater proportional success than is obtained by the orthodox surgeons. My reasons for this belief are not merely their own statements, or the greater popularity of their methods, and the general impression which prevails among a large section of the public that they are more successful than we are, but because we so seldom meet with their unsuccessful cases, compared with our own, although we are, naturally perhaps, inclined to make the most of them when we do meet with them. Their greater success is due, I doubt not, to the fact that they rarely or never operate when the lymphatic glands are affected, or when the primary disease is very extensive, or even when it has contracted extensive or important adhesions. Their applications, too, are directed to a thorough destruction of the disease and a sufficient area of the surrounding structures, and they are not diverted from their purpose by the necessity of performing set operations. That they succeed in a goodly proportion of such selected cases ought not to excite our wonder. We might be more disposed to wonder that, with such elaborate precautions, they should ever fail, did we not know that there are cases of cancer so malignant, and so rapidly malignant, that they defy even the earliest and best directed methods.

Of the use of caustics generally for the destruction of cancers, it may be said that they are only applicable to the cancers of the more exposed parts of the body. In the chapters which treat of these parts they will be referred to, and in the chapter on the Breast a detailed description will be found of the manner in which they can be applied. I have given a description of one of the best of them, Bougard's paste, which I have myself employed on several occasions, and which I have found thoroughly well adapted to the purpose. So much prejudice exists against the use of caustics, on account of the hands in which they have been chiefly held, that they have not, in my opinion, been employed so frequently as they might reasonably be. There can be no doubt that the cancer-curers employ them too frequently, and often foolishly and wrongly; but, on the other hand, I feel that we do not employ them sufficiently frequently. In selected cases, for the destruction of cancers of limited extent, in easily accessible situations, in old or very feeble persons, where it is of the highest importance to avoid shock and hæmorrhage, good results may be obtained with far less danger to the patient than can be afforded by operative surgery. The treatment is certainly painful, in some instances very painful; but there are many old and feeble persons, especially women, who will rather submit to great and long-lasting pain than brace themselves up to undergo what is to them far more horrible—the trial of a surgical operation. An anæsthetic is not necessary even during the destruction of the integument; and this is a distinct advantage in certain instances, not merely on account of the immediate danger and the after-effects, but on account of the fear which it inspires in nervous persons, which leads them to defer an operation as long as possible. On the other hand, the pain of the first application may be allayed by such administration of chloroform as is employed in ordinary cases of childbed, if the patient very much desires it, and if a large area of integument has to be destroyed.

The general plan of each chapter of this work is to give first a short outline of the usual course of the malignant diseases of the part of the body of which it treats, without entering on pathological questions further than is absolutely necessary. The best methods of operating are then described; and, where the operation has been practised in many instances, and successfully, by an individual surgeon, his method is described as far as possible in his own words. The results are then considered—first, with a view to discover how far the operations have been dangerous to life; next, how far they have been successful in permanently ridding the patients of the disease; and last, in a few of the sections, how far patients who have not been permanently relieved have nevertheless been benefited by operation.

Some of the statistics of operations have certainly surprised me—the large mortality, for example, of excision of the upper jaw, which I had not suspected to be nearly so large as it has proved to be. The relative mortality of amputation of the penis, too, with cutting instruments and the galvano-cautery was not what I had imagined. It is of the utmost importance that these matters should be placed before the profession to enable it to judge of the desirability, not merely of operating in a particular manner, but in some instances of operating at all.

On the question of permanent relief afforded by operation there will be many differences of opinion, for I find even now there are surgeons, not a few in number, who have no belief in the curability by operative surgery of patients suffering from cancer. For my own part, I have no doubt of the power of surgery to cure a certain number of cancerous patients, provided only the expression "cured" is understood in the same light in which it is understood when it is employed in reference to patients who have undergone amputation for some deformity, or an ulcerated leg, or excision for a diseased joint. The cases are comparatively rare in which the simple removal of the tumour suffices for a cure. It is almost always necessary to remove at the same time some of the surrounding tissues—in some instances a very wide area—in order to prevent a local recurrence of the disease. The "cure" is therefore wholly different to the cure of a cold or an erysipelas, which may leave the body apparently to all intents as sound and complete as before the disease attacked it. By the "cure" of a malignant disease, it is only intended to imply that the patient is rid of the disease, at the expense, maybe, of the loss of the part of the body in which it was seated; but he is rid of it, once and for all, as much as a man is rid of an erysipelas or a pneumonia, and far more than a man is rid of chronic bronchitis. No surgeon will attempt to deny that a patient who has once had a cancer, and has been treated successfully by operation, may suffer again from cancer. In all probability such patients are more subject to cancer than those who have never suffered from it. But the same argument applies to erysipelas, pneumonia, and many other diseases which are for the time completely recovered from. A patient may make an excellent and complete recovery from pneumonia this year, and, being exposed to similar conditions two years hence, may die of the same disease; but no one argues that the recurrence of the disease and death are due to the incomplete cure of the first attack, even if the same lung and part of the lung is attacked by the pneumonia on each occasion. It is very curious that, in dealing with the surgical treatment of cancerous diseases, a different tone is adopted. If a patient who has been treated by operation for a cancer of the lip or breast dies, ten or fifteen years later, from cancer of the lip or breast, or even of the ear or tongue, it is said, "Ah! the operation was only useful for a while; but you cannot cure persons afflicted with cancer by operation." It is at first difficult to understand why the operative treatment of cancer should be discussed in so partial a manner, and why an operation should be held as useless (so far as complete cure of an individual outbreak of a certain malady is concerned) because it does not afford a guarantee that the patient shall never, in the course of perhaps a long life, suffer from the same kind of disease again.

The explanation is manifold. There are instances of cancerous disease in which recurrence follows immediately on operation, for the disease was known not to have been completely removed. There are other instances in which the disease was thought to have been completely removed, yet recurrence followed as quickly as if visible fragments had been left behind. There are other instances, again, in which the disease has been believed to be very completely removed, and yet recurrence has slowly appeared in the course of a few months, perhaps within a year, or possibly not until eighteen or more months have elapsed since the operation. During the interval the scar and the surrounding tissues have remained perfectly sound to all outward appearance. Yet, in the large majority of these cases we are forced to admit that the operation was not really thorough, and that some cancerous elements, or elements certain to become cancerous within a comparatively short period, must have been left behind. And there are still other instances in which, without any alteration in the scar and the surrounding tissues, cancer has nevertheless appeared in the associated glands, or in a distant tissue or organ, within a year of the operation. The cancer is in all these cases of the same variety as that which was removed; and, in the cases in which the glands or distant parts of the body are affected without local recurrence of the disease, is still of the same variety as the original disease, and frequently of a variety which does not naturally occur in those parts.

The slow progress of cancerous diseases compared with such diseases as pneumonia, acute bronchitis, and erysipelas, and the long period which may elapse before a true and undeniable recurrence takes place, the frequency with which such true recurrences do take place, and the consequent numerous disappointments to which we are subjected, have led to an unjust estimate of the prospects afforded by operative surgery. This injustice has been carried so far that an immunity of fifteen or twenty years afforded by an operation has been thought too short to justify the claim of a complete cure. And I have heard distinguished surgeons say, within the last three years, in speaking of individual cases of cancer of the tongue or bones, that such and such a case was successful because the disease was not really malignant.

To the objection in reference to the true character of the disease, a decisive answer can be returned, for the naked eye and minute characters of the tumours have been recorded in some hundreds of successful cases.

But the time-question is much more difficult to deal with. In order fairly to meet it, an arbitrary period of probation has been adopted during which a patient may be regarded as relieved by operation, yet not cured. A period of three years has been proposed, and has generally been accepted, on account of the great rarity with which cancerous diseases exhibit true recurrence when that period has elapsed. The arguments in favour of the three years' probationary period have been chiefly drawn from the results of operative surgery in the treatment of cancer of the breast. Within a year after the operation, recurrences or affection of the neighbouring lymphatic glands are numerous. Between the end of the first and second years they diminish marvellously, and between the end of the second and third years there are scarcely any. If the actual figures are taken, such as those which are quoted by Gross from von Winiwarter, the results are as follow in 203 cases of recurrence. The disease recurred in 180 before the end of the first year, in fifteen between the end of the first and second years, in six between the end of the second and third years, and only in two after the end of the third year was passed. The test, therefore, may be regarded as thorough; and there need be no hesitation in claiming that all persons who remain well and free from cancerous disease for full three years after the operation, or the last operation (in cases in which more than one operation has been performed), have been cured of the disease.

In the discussion of the results of operations I have adopted the three years' limit, and have for the most part judged of the results by the measure of three years. But I have done so with the full admission to myself that just objections may be made to its general application to the results of treatment of the malignant diseases of all parts of the body. For instance, to apply the same test to sub-periosteal sarcomas as to sarcomas of the parotid, to carcinomas of the tongue as to carcinomas of the upper part of the face (rodent cancers), to quick-growing as to slow-growing tumours, is manifestly absurd. Different periods of probation should be fixed for the malignant diseases of different kinds, and still more for the malignant diseases of different parts of the body. But as such standards would be difficult to fix with any degree of certainty, and as the three years' period has been very largely accepted in works on cancer, I have judged it better to use it for the malignant diseases of all parts, particularly as the instances in which it is decidedly at fault are almost invariably those in which a shorter period of probation would be more just. The advantage, therefore, is certainly not in favour of the "cured" cases, and cannot be said to make the results appear more flourishing than they really are. Another advantage of applying the same standard to the cancers of all parts is that it affords a fair standard by which their relative malignancy may be judged.

There is, of course, an objection to so long a period, on the ground that it obliges surgeons to keep their patients a very long time under observation before they can be claimed as cured. Many of the patients are of necessity lost sight of long before three years have elapsed, and there is great difficulty, even when operators are most enthusiastic and determined, in arriving at any definite knowledge of the condition of hospital patients who were treated some years previously. In the following pages a vast difference will be found in the information of the quantity and quality of the results of operations. There is, for instance, practically no information regarding the later results of operations for the removal of cancer of the scrotum, apparently because no surgeon has, within the last thirty years, been so much interested in the subject in this country that he has thought it worth his while to seek out the patients who have been treated. The results of some of the more novel operations for malignant disease have, on the other hand, been collected and tabulated with singular correctness and completeness. The mere novelty of the operation suffices, in itself, to account for this. And, unfortunately, the results of some of them have not been long delayed. They have been apparent very shortly after the operation, either because it has terminated fatally, or because recurrence has taken place at a very early period. The few patients who have survived for a longer period have been of such phenomenal importance that it has been scarcely possible to lose sight of them.

In the calculation of percentages, the calculation has been made on one uniform basis. The percentages of deaths due to the operation have been estimated on the total number of patients who were treated by operation, and of whom there are records to show whether they recovered or died. The percentages of "cures" have been estimated on the number of patients who were alive and free from disease, or who died of some other malady (not cancerous), more than three years after the last operation, compared with the total number of patients who were treated by operation, and of whose end, or condition at the termination of that period, there are records. The fatal operation cases are therefore included in the totals. This course has not been adopted in all the statistical reports which have been published on these subjects. In some of them the percentage of cures has been estimated only on the total number of patients who recovered from the operation. There are, of course, reasons for the adoption of this method of reckoning, but I think there are still stronger reasons against it. If the question were asked by one of the laity, or even by members of our profession, how far an operation for the removal of malignant disease of a certain part of the body was likely to be permanently successful, and the reply was made that 15 per cent. of the patients remained permanently free from the disease (on the three years' limit), the questioner would be very much surprised, and probably greatly disgusted, to find at a later period that the calculation had been based only on the total number of persons who recovered from the operation and who had been kept under observation, and that the mortality due to the operation itself amounted to no less than 20 to 50 per cent. In some of the statistics, on the other hand, an injustice of an opposite character has been done. The percentage of successful cases has been calculated on the total number of patients operated on, whether they have been kept under observation or not. This method of reckoning has, I presume, been employed on the assumption that all the patients who have been lost sight of after recovery from operation were unsuccessfully treated. This opinion has been expressed by more than one surgeon, and has induced operators to take a more gloomy view of the permanent results of their operations than they should do. It is obvious, on consideration, that the only fair way of dealing with these patients is to leave them wholly out of the reckoning in estimating the percentages of successful cases. That many of them die within a longer or shorter period of recurrence or affection of the lymphatic glands or other parts of the body I have no doubt. But I have just as little doubt that some of them survive, and would be reckoned amongst the cured cases. I have had considerable experience in searching out the results of past operations for malignant disease, and certainly do not agree with Mr. Barker in his remark : "Others, of course, may have recovered and been lost sight of, but it is always usual for the successful cases to come to the surface" (Holmes's *System*, ii. 605, third edition). Many of the most successful cases which I reported in *Sarcoma and Carcinoma* some years ago would never have come to the surface had I not sought them out, often with great difficulty after numerous failures. Things have not altered much in this respect since the time when, more than 1800 years ago, only one of the ten healed lepers returned to give thanks to the Healer. Hospital patients return to the hospitals when they are forced to do so by a return of their disease or by some other malady, but it is not in the nature of things that people belonging to the lower orders, to whom the day is so valuable, should come or send after long intervals to let the doctor know how successful he has been.

All the experience I have had in connection with this matter leads me to believe that the results of operations for malignant disease in most of the external parts of the body would be better than they now appear to be if more of the cases were kept under observation. And I hold that this is very important both on behalf of the profession and the public; for it is of the highest importance to dispel as far as possible the gloomy prognosis which attends the efforts of operative surgery, and to encourage patients to submit at the earliest possible period to operation.

It may be thought that I ought to have taken into consideration *palliative* and *reparative*, as well as curative, operations. On the whole, however, I have thought it better not to do so, partly on account of the great increase of bulk which this book would have attained, partly on account of the difficulty of knowing where to stop. The scope of the work, therefore, has been limited to the methods and results of radical or curative operations.

CHAPTER II.

MUSCLES.

Since the period at which Teevan wrote an article "On Tumours in Voluntary Muscles" in 1863 (*British and Foreign Med.-Chir. Review*, xxxii. 504), very few cases of primary malignant disease of the voluntary muscles have been published. Indeed, I have only been able to gather together from many sources rather more than twenty cases for which an operation was performed. Few as is the number of cases, they afford, however, very important information on the subject. In the first place, in spite of the many different names which have been attached to the tumours, there is reason to believe that the voluntary muscles are rarely, if ever, primarily attacked by any other disease than sarcoma. The tumours which I have myself examined have been round- or spindle- or oval- or mixed-celled sarcomas; and I am not aware of any trustworthy examination of the so-called cancers or scirrhus or encephaloid tumours from which one could judge whether they were really what they were thought to be.

The muscles which were affected in the upper extremity were the deltoid and pectoralis major, the biceps and triceps, and the brachialis anticus; in the lower extremity, the glutæus maximus, the sartorius and adductors, the rectus, the gastrocnemius and soleus, and the peroneus longus; but the pectoralis major, the biceps, and sartorius were more often affected than any of the other muscles. The patients were male and female, and varied in age from twelve to seventy years. The disease was much more common in adults than in children. Some of the tumours grew very slowly, but their speed of growth differed largely in different patients and at different periods of the history of the case, becoming much more rapid in several of them shortly before the operation was performed. They varied also greatly in shape and size. Some of them occupied the interior of the sheath, destroying or involving the structure of the muscle, and replacing it by a growth nearly resembling it in shape, but of much larger size. Others of them presented a globular or oval shape, and their size varied from that of an egg to that of the head of an adult man. In those instances in which the disease was left to itself, the tumour grew through the sheath of the muscle, infiltrated the adjacent muscles or other of the soft structures, became adherent to the integument, and in time ulcerated. I have only found one instance in which there was glandular affection associated with the primary tumour—a case in which the disease was of the triceps muscle, and a lymphatic gland was matted to the ulnar and musculo-spiral nerves; but what relation this gland bore to the disease, or whether it was involved in the continuous growth of the tumour, there is no evidence to show. In nearly every instance, no matter what was the situation or extent of the primary disease, a special note stated that the lymphatic glands were not affected. In two instances, enlargement of glands was noted with recurrence of the primary disease: one of these was the case which has just been mentioned; the other was a case of primary tumour of the biceps muscle, in which, when the disease recurred after removal, the cervical glands were noticed to be enlarged. In one or two instances there were two tumours, separated by a larger or smaller interval, but in the large majority of cases the primary disease was single. As a set-off against these negative qualities of primary malignant disease of the muscles, there was exhibited one positive quality of the greatest importance so far as their treatment is concerned—their great tendency to recur *in sitû*. Recurrence took place in every instance in which the patient recovered from the operation and was kept under observation afterwards. Of the occurrence of secondary disease of the organs or distant tissues I can say little, for the cases which I have collected afford very little information on the question. In one instance (of an oval-celled sarcoma of the adductor muscles of a year's duration) there were three nodules in the lung when the patient died the day following amputation at the hip-joint; but in other instances, of much longer standing, no secondary disease was discovered at the autopsy, even when the disease appeared to have run its natural course.

Methods of Treatment.—I am not aware that any one has followed out the suggestion of Teevan to remove the entire muscle from end to end in the surgical treatment of malignant disease, nor do I think that the least advantage would be gained by such a step. On the other hand, it is quite clear, from a perusal of the histories of cases, that the incisions should be carried very wide of the tumour on account of the great tendency of the primary sarcomas of the voluntary muscles to recur. Only two operations were practised in the cases I have seen and collected—excision of the tumour and amputation of the limb. In some of them, the tumour shelled out easily; in others, a difficult and dangerous dissection was required before it could be removed, and a portion of the muscle in which it lay was cut away above and below. Amputation was performed in cases in which the tumour was of large size and reached close up to the joint at or near to which the amputation was performed. It was also performed for the removal of recurrent disease.

No description is needed of such operations; indeed, no two of them (the excisions) were alike. They varied according to the situation and extent of the tumour, and the dressings differed according to the period at which they were performed and the usual practice of the operator.

Results of Operations.—Of the twenty-two patients who submitted to operation, three died of the direct effects of the removal of the disease. In these three cases the tumour was of very large size, situated in the adductors, the soleus, and the pectoralis major. In the first, amputation at the hip-joint was performed, and the patient died of shock at the end of twenty hours. Had his life been spared it could not have been for long, for there were already several nodules in one of the lungs. In the other two cases the tumour was simply removed by dissection: one of the patients died of hæmorrhage, the other of pyæmia. The percentage of deaths is large, but I think not larger than might be expected to follow such extensive and severe operations as the majority of those which were performed. The number of operations was of course far larger than the number of cases, for a second operation was performed in more than six of them, and several operations in one instance in which the disease had recurred four times when the last report was written. An idea may be obtained of the severity of some of them by the recital of a case under the care of Volkmann, who cut away four inches of the femoral artery and vein during the removal of a recurrent tumour of the sartorius.

Of the nineteen patients who recovered from the operations, eight were lost sight of as soon as they left the care of the surgeon.

In every one of the remaining eleven patients, recurrence of the disease was noted. The reappearance of the tumour was immediate in two of them, and occurred within a few weeks in other cases. With two exceptions, in which the tumour began to grow again at the end of eighteen months and two years respectively, the recurrence took place always within six months of the removal of the primary disease. But it must be noted that the operation, in every instance save one, was limited to the mere removal of the disease, with a greater or less quantity of the surrounding tissues. In the one exception, the arm was amputated at the shoulder-joint, but the disease was already far advanced, and extended so far upwards that the line of the amputation did no more than just clear it.

Of cases cured I have not one to report, or indeed of anything resembling a cure, so that the prognosis of malignant disease of the muscles, so far as our records of operative surgery reach, is almost as bad as it can be.

Yet I believe there is a better future in store for the operative surgery of this disease, provided it is considered in the serious light in which the recorded cases place it. Evidently the great danger to guard against is the local recurrence of the tumour, which is far more difficult to deal with than the primary disease. There is only one means which offers a reasonable prospect of permanent relief—amputation, wherever it is possible, high up above the tumour. Until this has been tried, and the results are placed before us, it would be premature to express a decided opinion on the prospects which may be offered by an operation in individual instances of malignant disease of voluntary muscles. One thing is, however, clear—namely, that operative surgery offers practically no prospect of cure when the disease attacks such muscles as the great pectoral, the deltoid, and the glutæus maximus, which are so situated that such an operation as an amputation is impracticable.

CHAPTER III.

THE BONES.

In the consideration of this part of the subject, it is essential that the sub-periosteal tumours should be separated from those of central origin, and further to consider, as far as lies within our power, the results of treatment on the sarcomas of the different bones separately.

It will be well to regard all primary malignant tumours of bone as sarcomas, whether they exhibit an alveolar structure or not. Probably the modifications of their structure do not affect materially the course which they pursue. One thing, however, with regard to structure must be borne in mind—the round-celled sarcomas are, speaking generally, much more malignant than the spindle-celled or mixed-celled tumours. This accords with our experience of round-celled sarcomas in all parts of the body. The mixture of the proper elements of sarcoma with those of cartilage, bone, or fibrous tissue has, so far as I am aware, no influence on the course of the disease.

Sub-periosteal sarcomas may affect most of the bones of the body, but they are very rare in the short and irregular bones. Those bones with which we have to deal are the bones of the thigh and leg, the arm and forearm, the clavicle and scapula, and the jaw-bones, but it will be more convenient to take the jaw-bones in another chapter. I have said nothing of the skull and bones of the pelvis, for, so far as surgery is concerned, the sarcomas of those bones are not within the reach of removal with any reasonable prospect of success. For the same reason I omit the sternum. The ribs ought not to be omitted, but primary sarcomas of the rib-bones are not so frequent that they need occupy our attention.

The lower end of the *Femur* is usually the seat of sub-periosteal sarcoma, of whatever variety, but the occurrence of the disease is not limited to the lower end. The tumour in most instances increases rapidly in size, but the rate of growth is subject to considerable variation. Young and middle-aged adults of both sexes appear to be more liable to the disease than persons at the extremes of age. The tumours frequently ossify and calcify and chondrify, and undergo cystic or cystoid degeneration. However large they may become, they rarely ulcerate. The lymphatic glands are not usually affected, although those tumours which are seated at the upper end of the bone may produce glandular affection if they attain a sufficiently large size to reach the nearest lymphatic glands. Secondary growths are common in the lungs, and they may occur in other organs, for there are many cases on record, especially of round-celled sarcomas, which have been associated with secondary tumours in many different tissues and organs. It is not easy, from the comparatively small number of cases which are recorded where no operation has been performed, to calculate the natural duration of the disease, but there are many cases to show that death may take place within a year or fifteen months from secondary growths in the lungs and other organs.

Sub-periosteal sarcoma of the *Tibia* usually attacks the upper end of the bone. The tumours are of slower growth than those of the femur, attack persons of rather more advanced age, are rarely, if ever, associated with affection of the lymphatic glands, and do not appear to affect the internal organs, or any tissues or organs, with secondary growths so frequently as do the tumours of the femur. They may be regarded, therefore, as inferior in malignancy to the tumours of the femur.

The number of cases of tumour of the *Fibula* is scarcely sufficiently large to allow of generalization on their characters. They appear to affect the upper end of the bone, like the tumours of the tibia, but their course seems to be more rapid and the rate of growth quicker than that of the tibial tumours. They do not affect the lymphatic glands, but there is not sufficient evidence to show whether they are frequently associated with secondary growths in other organs and tissues.

Of the characters and course of the tumours of the *Scapula* I can only speak in modified terms, on account of the difficulty of distinguishing the tumours of sub-periosteal from those of central origin. As in considering the treatment of the scapular tumours I shall be obliged to consider all of them together without reference to their precise origin, so I think it will be better here to include their course and characters in one description. My own impression is that the great majority of them are of sub-periosteal origin; and this I judge not only from the accounts which have been given of their structure and conformation, but also from their rapid course and obstinate malignancy. The dorsal aspect of the scapula is usually affected, but the tumour may project on both surfaces of the bone, in the same manner as do many of the sub-periosteal sarcomas of the flat bones of the skull. The growth of the disease is almost always rapid, so that a very large mass may be formed in the course of a few months. The surrounding structures are early involved. Removal is usually speedily followed by recurrence of the disease. But the axillary glands are rarely affected. Secondary tumours may form in the lungs and other organs.

Sub-periosteal tumours of the *Clavicle* are not of common occurrence. So far as can be judged from the few cases which have been collected, they appear to be very malignant, returning quickly after removal, growing into the neighbouring lymphatic glands, and, through them, reaching those glands which are situated farther from the primary tumour. They may attack either end of the bone.

The tumours of the *Humerus* appear to be peculiarly malignant. Wherever they take their origin they spread with remarkable rapidity along the bone, so that they may affect its whole length and reach the upper and the lower end within a very few weeks after their first appearance. In spite of this rapid course, there is no tendency to affection of the axillary glands. Like other sub-periosteal tumours, but with much greater rapidity and certainty, they grow into the surrounding muscles. They may also extend from the humerus to the clavicle and scapula. Secondary tumours may occur in the lungs and other organs.

The *Radius* and *Ulna* are usually affected at their upper ends. The growths are apparently not so malignant as those of the humerus, but the number of cases which has been collected is not sufficient to allow of enlarged speculation regarding them.

Methods of Treatment for Sub-periosteal Sarcomas.—With few exceptions, amputation is the only operation which is practised for the cure of sub-periosteal sarcomas. The exceptions are the tumours of the scapula, the clavicle, and some of the tumours of the radius and ulna. For the tumours of the scapula, removal of the entire bone is usually practised; for tumours of the clavicle, resection of the affected portion of the clavicle; and resection of the affected portion of the radius and ulna has been occasionally performed for sarcomas of the lower ends of these bones.

It will not be expected that I should here describe the methods of amputation of the limbs. They do not differ from those which are practised for other diseases which require amputation, the only special precaution being to amputate far above the disease. On the question which is often raised regarding the advisability or necessity of amputating at or above the first joint above the disease, so as to remove the whole of the bone which is the seat of disease, I shall speak presently, when the results of the operations are discussed.

There are no operations which can be called "standard" for the resection of portions of the clavicle, the radius, and ulna for malignant disease; the operation depends on the extent and relations of the disease in each individual case. It must be quite evident that resection of a portion of the clavicle for a tumour of even moderate size is a much more formidable procedure than resection of a portion of the radius or ulna, on account of the important relations of the clavicle. The tumour may extend to and actually press upon the subclavian vessels, the innominate vessels, the phrenic and pneumogastric nerves, the pleura, &c., one or other of which may be wounded in the course of the operation. Even the comparatively trivial hæmorrhage which flows from such veins as the external jugular and posterior scapular is abundant, and suffices to delay the progress of the resection, and greatly to increase its danger. Another danger in connection with partial or complete resection of the clavicle which should certainly not be overlooked is the opening up of the layers of the deep cervical fascia, which may be followed by deep-seated and spreading inflammation and suppuration—a danger I venture to think not so great at the present time as it was fifteen or twenty years ago, on account of the better methods which we now employ of managing wounds.

I purpose to describe in a few words the typical operation for complete removal of the scapula, in order to save the reader the trouble of seeking it in the larger works on general surgery or in treatises on operative surgery. Holmes (*System of Surgery*, iii. 742, third edition), who does not appear to have himself performed the operation, but who has seen it performed for the removal of a large malignant tumour (probably by Pollock), thus describes it:—"The total excision of the scapula for a tumour should be thus performed. The patient being brought under anæsthesia, an assistant should be charged with the compression of the subclavian artery, for which purpose, if the projection of the tumour makes compression difficult, the incisions may be so managed as to enable him to put his finger directly down upon it. This precaution much diminishes the hæmorrhage from the sub-scapular artery and its branches, which otherwise might be formidable. The surgeon then proceeds to denude the tumour of its outer coverings by turning down appropriate skin flaps, taking great care, however, not to open the capsule of the tumour itself. When the whole tumour is thus exposed, the muscles inserted into the vertebral border of the bone should be rapidly divided, as also those which are attached to the spine of the scapula. The tumour, being now movable, should be lifted well up, and freed from its other attachments by rapid strokes of the knife, commencing from its LOWER angle. The sub-scapular artery is divided near the end of the operation, and can be caught hold of by the surgeon or his assistant, and held till the tumour is removed, or can be at once tied. The ligaments of the shoulder are then easily divided, and the mass removed.

"The acromion process, if not diseased, may be divided with bone-nippers, and left behind to preserve the shape of the parts and protect the head of the humerus.

"In this way I have seen the scapula removed with a very large and vascular tumour without any serious bleeding."

To this description I think the following additions may be made:—The incisions which are usually found suitable are an incision from the acromion process along the spine to the posterior border of the bone, and a second incision from near the centre of the first incision down to just beyond the angle of the scapula. These two incisions may be prolonged or may be supplemented by other incisions if it is found impossible or very difficult to remove the bone through them. Very free incisions, so far from increasing the danger, are decidedly advantageous. They not only permit the operation to be performed with greater ease, and with much greater certainty of the power of immediately arresting serious hæmorrhage, but they afford the means of thoroughly draining the wound wherever drainage appears to be needed.

For the more speedy arrest of hæmorrhage during the operation, the operator should employ Wells's clamp-forceps.

In addition to the complete removal of the scapula it may be found desirable at the time of the operation to remove also the head of the humerus or a portion of the clavicle. The clavicle has been removed, either in whole or part, in many of the cases in which the scapula has been excised.

On the other hand, the tumour may be so situated that the neck and glenoid cavity may be left behind; and although it is said that partial removals of the bone have been more fatal than the complete removal, I can scarcely imagine that a surgeon, finding it possible in the course of the operation to leave the shoulder-joint intact, and yet remove the disease very completely, would not take advantage of this circumstance.

After the removal of the bone and the closure of the wound, due care being taken that the most perfect drainage shall be arranged, the dressing which the operator prefers is applied. The arm and forearm are then fixed close to the side, and the patient is laid in bed. He may be placed on the opposite side to that from which the bone has been removed, and, in the course of a few days, may be laid on his back, or inclining towards the back, so that the discharges may escape as quickly as possible. His position may be maintained by means of pillows.

Results of Operations.—Although the *Scapula* was taken last in the preceding paragraphs, it will be convenient to take it first in considering the results of operations. I have already said that it is often impossible to distinguish the tumours of sub-periosteal from those of central origin, not only before the removal of the disease, but even when the specimen has been dissected and examined with care. Many of the recorded cases of removal of the scapula for malignant disease do not contain anything in the account which allows the reader to discover whether the disease was of central or periosteal origin. I have therefore thought it well to include the tumours of both origins in this part of the chapter on the Bones, and to consider the mortality of the operation, and the prospects of the patient after recovery from the removal of the scapula, without reference to the exact origin of the disease.

The largest table of complete removals of the scapula with which I am acquainted is that published by Poinsot, in 1885, in the fifth volume of the *Revue de Chirurgie* (p. 201). He has collected forty-five cases, of which, however, only twenty-five appear to have been for the removal of tumours which were certainly or perhaps malignant. Many of them were for necrosis of traumatic or idiopathic origin. Only in seventeen of the twenty-five cases is the disease distinctly stated to have been "carcinoma" or "sarcoma," but the history of other cases leaves little doubt in the mind of the reader that the disease was malignant. Of two or three cases I am not certain, for the disease is set down as "osteo-chondroma" or "myxo-chondroma;" but I have included them in the list, not knowing whether they might perhaps be really sarcomatous tumours which had undergone partial transformation into bone and cartilage and mucous tissue, but with the intention of mentioning them particularly in the consideration of the immunity from recurrence afforded by the operation.

Of the twenty-five cases of removal of the scapula for disease which certainly was or may probably have been malignant, only two patients appear to have died of causes which may be directly attributed to the effects of the operation. One died of bronchitis on the sixth day; the other, of emphysematous gangrene, which rapidly spread down the arm, and proved fatal on the third day after the operation. Both these patients were males, one forty-seven, the other fifty-two years old. The operation in the former was performed by Pollock, in the latter by Poinsot. In addition to the removal of the scapula, a portion of the clavicle was removed in both cases.

Poinsot finds, on the whole forty-five cases in his table, that the mortality was about 10 per cent.; on the twenty-five cases I have abstracted, the mortality is not more than 8 per cent. Even allowing the larger mortality to be the more correct, a mortality of 10 per cent. is by no means large, when the extent of the operation and the large size of the tumour in many of the cases is taken into account. The fact may be in part explained by the circumstance that, although the operation was performed on patients of various ages, from six to seventy years of age, at least eleven of the twenty-five patients were under twenty years of age, and only three of them are stated to have been fifty or upwards of fifty years old. One of these three, as the last paragraph shows, died of the direct results of the operation. The age of several of the patients is not mentioned, but there is sufficient evidence to show, not only that the small mortality due to the operation is probably largely influenced by the youth of the patients, but also that malignant tumours of the scapula are singularly frequent in young persons. I do not, of course, pretend to say that nearly one-half of the cases of malignant disease of the scapula occur in persons under twenty years of age: the explanation of the large proportion of young persons in Poinsot's table lies much more probably in the circumstance that these cases were selected for operation largely on account of the youth of the patients, which gave promise (abundantly fulfilled) of good result.

Complete Cures due to Operation.—Unhappily, the good prognosis of the immediate results of the operation is not followed by an equally good prognosis of the later results. I can only find a statement of permanent cure in six cases, and, when these come to be examined, it is doubtful whether more than one of them can really be claimed as cured. In four of the six there is merely a statement, in the column which refers to the later result of the operation, to the effect that the patient was cured, and in the preceding column in each case the statement is made that the movements of the arm were good or fairly good; but the duration of the "cure" is not mentioned in any of these cases—it might have been only a few months. In the fifth, Michel's case, that of a man fifty years of age, the whole scapula, together with the outer third of the clavicle, was removed for a tumour which is described as "myeloid and cystic." The recovery was so excellent that the patient was able to perform the most laborious tasks in the fields, and was known to be in good health six years after the operation. In the sixth case, Schuppert removed the entire scapula from a woman, thirty-six years old, for what is termed an "osteo-chondroma," and the patient was quite well with a useful arm eighteen months after the operation. But on this case two suspicions rest—first, that the interval between the operation and the last report is not yet long enough to guarantee the permanency of the cure; second, that the tumour was not at all certainly a malignant growth. It may have been a sarcoma which was in great part transformed into bone and cartilage; but it may as probably have been a simple osseous and cartilaginous tumour, a form of disease not very uncommon in connection with the scapula. If the final result or the fact of recurrence of the disease were not noted in many of the cases, so that it might be said that the patients were not followed up, the dearth of successful results might have been explained on that assumption; but, in addition to the four cases of which the duration of "cure" is quite uncertain, there are only three instances in which there is no note of the patient after recovery from the operation. Poinsot's table therefore contains only one instance in which there is evidence of a durable recovery, and one still doubtful instance (Schuppert's), after the removal of the scapula for malignant disease, out of eighteen cases in which the result of the operation is known. In the remaining cases, the results are as follow :—One patient died of marasmus within two months of the operation, but the cause of the marasmus is not stated. Another patient appears to have died very shortly after the operation, and apparently from recurrence of the disease or from internal malignant disease, but the details are not sufficient to permit us to judge of the exact period or cause of death. In a third case (Walder's) the disease is said to have been an enchondroma, and may indeed have been so, but there was recurrence in two years which necessitated amputation of the upper extremity, so that the diagnosis was more probably incorrect, and the disease was in truth a chondrifying sarcoma. The further history of the case is not described. In eleven cases the patient is distinctly stated to have died of recurrence of the disease. In two of the eleven the duration of life after the operation is not mentioned ; but in all those in which it is mentioned the patient died within a year, and in several of them recurrence took place almost immediately. I do not know that the expression "recurrence," in the sense in which we generally use it, is justified in every one of these cases, for in one instance the "recurrence" is said to have taken place in the lungs. But in the very large majority of the eleven cases the recurrence appears to have been truly a return of the disease *in sitû*.

The prospects afforded by surgical treatment of malignant disease of the scapula, as they appear in Poinsot's table, are not encouraging. A total of twenty-five cases. Two deaths due to the operation ; two deaths within a very short period of the operation, probably in both instances due to disease of the internal organs ; eleven deaths due to recurrence of the disease or to affection of the lungs ; one recurrence in less than two years, which necessitated amputation of the upper extremity ; three patients lost sight of shortly after recovery from the resection ; four patients said to have been cured, but without any information of the permanence of the cure ; two cures of eighteen months and six years respectively, but with great uncertainty whether the disease was really malignant in the former of the two cases.

In spite of the poor prospect of permanent cure by removal of the disease, the operation will probably not only continue to be performed as frequently in the future as in the past, but will grow in favour with surgeons for several reasons. The mortality is not at all large for so large an operation; the diagnosis between malignant disease and such diseases as ossifying chondroma or simple chondroma is so difficult that it can only be decided, in many instances, by a free incision into the tumour, and even then may remain uncertain. Under such circumstances most surgeons would prefer to remove the diseased bone rather than to leave a tumour which may perhaps not be malignant, but which would probably prove fatal at a later period, and which might become a source of grave distress and pain; the prospect of cure, although very bad, is not absolutely hopeless, even if the disease is malignant. It will probably be found that there is a much better prospect of complete cure in those cases in which the growth arises in the space between the compact layers of the bone than in those in which it is distinctly of sub-periosteal origin, in accordance with the law which prevails in respect to the malignant tumours of the long bones, but there is not yet sufficient evidence to prove that this is so.

Before leaving this subject, it is right that the statement of an American surgeon, Dr. Brinton, should be noted, although it does not rest on a published table. In the sixteenth volume of the *Philadelphia Medical Times*, p. 106 (1885), after giving an account of a case of removal of the scapula, Dr. Brinton says: "Statistics show that the mortality following the operation is greater where a portion of the bone is left than where the entire bone is removed. In forty cases of entire removal, the mortality was 20 per cent.; after partial removal, 21 or 22 per cent." I do not know what statistics Dr. Brinton has consulted, but imagine he may either have collected cases scattered through surgical literature or have taken the statement of one or other of the larger text-books of surgery. Nor do I know for what diseases or accidents the scapula was removed in the cases from which his statistics may have been drawn up. It appears possible, if not indeed probable, that the large mortality he tells of is due to the fact that some at least of the forty removals were performed for recent injuries, in which case the mortality might reasonably be expected to be large, as primary amputations are much more fatal than amputations for disease.

Humerus.—*Mortality due to Operation.*—The operation necessary for the treatment of sub-periosteal sarcoma of the humerus is, in almost every instance, amputation at the shoulder-joint, partly because the disease is often primarily seated at the upper end of the bone, partly because of the rapidity with which it extends along the bone when it takes its origin upon the shaft. We have therefore practically to consider the mortality of amputation at the shoulder-joint performed, not for accident, but for disease. Taking the statistics of Schede (published by MacCormac, *Antiseptic Surgery*, 1880) and those of St. Bartholomew's Hospital during the last twenty years, I find a total of twenty-four cases with sixteen recoveries and eight deaths, which must be regarded as a very heavy mortality. Fortunately, this does not represent the mortality which may be expected at the present day. Putting together Schede's statistics during the later period, in which the cases were treated antiseptically, and the cases of the last ten years of the hospital, the total number is fourteen cases with ten recoveries and four deaths. Even this must be regarded as a very large mortality, especially when it is taken into account that many of the patients were young persons. It nevertheless corresponds with singular exactness with the results I have obtained by putting together the eight cases of malignant disease of the humerus in my tables (*Sarcoma and Carcinoma*) and six which have occurred since the publication of the tables. Four of these fourteen patients died of causes connected with the operation; but in one of the cases the operation was not amputation, but resection of a large portion of the upper end of the bone. Quite apart from the ordinary risks of an amputation performed so close to the trunk, and the cutting off of so large a member as the entire upper extremity, the hæmorrhage in amputations for malignant disease is often very considerable, and I do not think that we are sufficiently careful in the means taken to prevent or diminish it. Within the last two or three years I have known two patients die, one of primary, the other of secondary hæmorrhage, after this operation, performed for malignant disease of the upper end of the bone; and I am strongly of opinion that the wisest course is to ligature the axillary artery before proceeding to remove the limb. Not only is the danger of excessive loss of blood avoided by this measure, but the operation can be performed with greater leisure and more attention to the complete removal of the growth. This attention is the more necessary because the sub-periosteal sarcomas of the humerus are very prone to extend on to the clavicle and scapula, and to invade the muscles and other tissues around and beyond the humerus.

With greater care in the prevention of hæmorrhage, and with the greater care now exercised in the management of amputation wounds, there is good reason to hope that the mortality due to the operation may be diminished during the next ten years; but there is, on the other hand, reason to fear that it will always be large, on account of the extensive nature of the operations which are usually found necessary for the complete removal of the disease. It may fairly be objected that the number of cases I have used for the study of the mortality due to operation is far too small. While I admit this charge, I must at the same time state my belief that a larger number of cases would probably afford worse rather than better results, for the amputation-statistics quoted have been extolled on account of their low mortality.

Cures due to Operation.—The results in the cases, fourteen in number, of which mention has been already made are certainly very bad. There is not one of them on which we can look with satisfaction. Four of the patients died of the operation, and two were not followed up after recovery. Of the remaining eight patients, every one was known to have suffered from recurrence of the disease *in sitû*. In two cases operations were performed for the removal of the recurrent growth. One of these two patients, whose recurrent disease was removed by entire removal of the scapula, was free from disease three months after the operation; the other was well at the end of ten months. These are the best results which I have to show in cases of sub-periosteal sarcoma of the humerus. Two of the cases of recurrent disease were not followed up to the very end, but they were certainly doomed to a speedy death; the remaining four cases all proved fatal in the course of a few months or weeks.

Conclusions.—The number of cases from which to arrive at a conclusion as to the prospect of successful surgical treatment of sub-periosteal sarcoma of the humerus is very small. From the facts before us, however, we cannot but form the opinion that the disease is horribly and rapidly fatal, and that the prospect of complete cure, or even of long immunity from recurrence, is singularly small, while the mortality due to the operation is very large.

The hope of much better results in future is scarcely to be entertained, for amputation was performed in a large proportion of the cases within three or even two months after the first appearance of the disease—a very short period, when the difficulty of an early diagnosis and the severity of the treatment are taken into account.

Radius and Ulna.—*Mortality due to the Operation.*—In this case, again, the real question at issue is that of amputation of the arm or of the forearm for disease, for one or the other of these operations is almost invariably performed, according as the tumour of the forearm is seated in the upper or the lower half. Taking statistics from the same sources as those which furnished the statistics of amputations at the shoulder-joint, I find that sixty-eight cases of amputation of the arm afforded sixty-two recoveries and six deaths, while eighty-two amputations of the forearm afforded seventy-seven recoveries and five deaths. The statistics of the antiseptic period of MacCormac and Schede's list and of the last ten years of the St. Bartholomew's Hospital tables offer a slightly better result: for the arm, thirty-six cases with thirty-three recoveries and three deaths; for the forearm, forty-two cases with forty recoveries and two deaths. It cannot be denied that these results are very good, nor is it likely they will be much improved for large numbers of cases in which the amputations are performed by many different surgeons under very different conditions.

Cures due to Operation.—On this point I have really no information to offer. My tables only contain three cases of sub-periosteal sarcoma of the radius and ulna, and I have not been fortunate enough to collect any to add to them, although I have collected thirty-three additional cases of sub-periosteal sarcoma of the long bones. The disease is evidently very rare, for the thirty-three cases added to the original fifty-seven (of the long bones) contain only three sarcomas of the radius and ulna. Amputation of the arm was performed in all three cases; but, in spite of this, both of the patients with disease of the ulna died, in each instance from the formation of new tumours, although there was not recurrence in the stump in either. The woman whose arm was amputated on account of recurrence of the sarcoma of the radius after resection was not, so far as I am aware, followed up after the healing of the wound.

Conclusions.—The only conclusions at which we can arrive are that amputation performed for sub-periosteal sarcoma of the bones of the forearm is not a very dangerous operation, even if the amputation is performed through the lower third of the arm. How far it will afford immunity from extension of the disease there is practically no evidence to show, although it may with confidence be said that there is very little likelihood of recurrence of the tumour in the stump provided the amputation is performed well above the disease.

Femur.—*Mortality due to the Operation.*—With scarcely any exception, the operations performed for the cure of sub-periosteal sarcoma of the femur are amputation either at the hip-joint or high up in the thigh. In order to estimate with tolerable accuracy the mortality of these operations, I have collected thirty-two amputations at the hip-joint and 580 amputations through the thigh (performed for disease) from the following sources:—Gant's *Surgery* (Spence's operations), MacCormac's *Antiseptic Surgery* (Schede's operations), and the tables of my own hospital. The thirty-two amputations at the hip give fifteen recoveries and seventeen deaths; the 580 amputations through the thigh give 464 recoveries and 116 deaths. But, treating these numbers as I have already treated those of the amputations of the upper extremity, and taking only those of the antiseptic period in MacCormac's tables and those of the last ten years of the hospital statistics, a great improvement is manifest for the amputations through the thigh, although no improvement is found in the amputations at the hip-joint. For the hip the numbers are twenty-one amputations with ten recoveries and eleven deaths; for the thigh, they are 265 amputations with 232 recoveries and only thirty-three deaths. That amputation at the hip-joint will always, no matter what care is observed in the selection and management of the patients, remain one of the most fatal of capital operations is only what might be expected from the vast size of the part of the body which is removed. Yet I cannot but think that the mortality ought to be reduced by the employment of three measures of precaution: Davy's lever for the diminution of hæmorrhage during the operation, Furneaux Jordan's method of amputating (Holmes's *System of Surgery*, iii. 720, third edition), and the most careful antiseptic precautions.

In my tables of sub-periosteal sarcoma there are twenty-two cases for which amputation was performed. To these I have added fourteen other cases, making a total of thirty-six. Amputation was performed at the hip in exactly half the cases, and in the remaining eighteen the amputation was through the thigh. The total mortality was nine, four of the deaths occurring among the amputations through the thigh, five in the cases of amputation at the hip. The mortality of the hip-amputations is therefore small compared with that which has been already given, and the mortality of the amputations through the thigh is very large. The former circumstance I should endeavour to explain on the supposition that some, if not many, of the amputations at the hip in the general statistics were performed for the removal of disease of the hip-joint, and therefore on persons extremely debilitated and wholly unfit to bear so serious a mutilation, while the patients on whom the operation is performed for malignant disease, although probably seldom in good condition, are in far better condition than those who have been suffering for years from suppuration in connection with disease of the joint. The second fact may be explained by the circumstance that amputations for sub-periosteal sarcoma are almost invariably through the upper third of the thigh, while those in the statistics used were through all parts of the thigh, many of them therefore through the lower third. A total mortality of 25 per cent. on all the amputations for sub-periosteal sarcoma of the femur is certainly very large, but I scarcely think it can be regarded as excessive when the seat of the amputation is considered, although, on the other hand, it must be taken into account that the large majority of the patients were, so far as age is considered, in the prime of life.

Cures effected by Operation.—There is, unfortunately, in this section little that is pleasant to record. Of the total of thirty-six patients, nine died of the effects of the operation, and ten were not kept under observation. There remain therefore only seventeen patients whose cases were completed for our purpose. Of these, six died with recurrence of the disease in the stump, and seven died without local recurrence, but in all probability of secondary disease. Indeed, five of the seven were stated to have died of secondary disease, and the two remaining patients died within six and eight months after the amputation.

The remaining four patients give the following record :—A boy, sixteen years of age, whose thigh was amputated for the removal of an ossifying round-celled sarcoma of the lower third which had been noticed only about a month, was alive and well fourteen months after the operation. Another boy, sixteen years of age, whose thigh was amputated for the removal of an ossifying mixed-celled sarcoma of the lower third, was well a year after the amputation. A woman, twenty-four years old, suffered amputation of the thigh for the relief of a spindle-celled sarcoma of the lower third ; the disease speedily recurred, and the hip was amputated ; a year later she was alive and well. A young man, of twenty-three years, had a medullary tumour of the lower end of the femur containing bony spiculæ ; at the end of four months the thigh was amputated, and eight years later he was quite well. This last case, which is the only recorded case of cure which I have found, is reported by Mr. Holmes. I have already in a foot-note on p. 73 of my book, expressed a doubt whether the tumour was not rather a central than a sub-periosteal tumour of the bone. And I may again utter the hope expressed in the concluding sentence of the note that it may have been truly sub-periosteal, for it would afford reason for a slightly better prognosis after operation. The duration of the disease at the time of the amputation in the first and fourth cases was very short, one month and four months. This circumstance may, perhaps, have had something to do with the happier results of the operations ; but, on the other hand, it must be admitted that there is quite a large proportion of cases in which the limb was removed within two or three months after the first appearance of the tumour, and the patients died of recurrence or of extensive secondary tumours.

Conclusions.—It is much to be desired that cases of operation for sub-periosteal sarcoma of the femur should be kept under observation by the operators, in order that we may obtain much more accurate and more extensive knowledge with regard to the ultimate results of operations than we at present possess.

Our present knowledge leads us to believe that amputations performed for this disease are very dangerous to life, and are rarely successful in affording a permanent cure or even reasonably long relief from the disease.

Tibia and Fibula.—*Mortality due to Operation.*—As the disease is, in the very large majority of instances, situated in the upper third of the bones of the leg, the operation which is performed for its relief is amputation through the thigh. In those cases in which the lower third of one or other of the bones is attacked, the limb is usually removed by amputation at the knee or through the leg. From the same sources as have been used in the preceding sections, I have examined into the mortality of amputations of the thigh and leg. In the section on the femur it was stated that the later and better statistics gave 265 amputations through the thigh, with 232 recoveries and only 33 deaths. For amputations through the leg, the total number of cases is 283, with 236 recoveries and 47 deaths. The improved statistics of the last ten years and of the antiseptic period, give 114 amputations, with 104 recoveries and 10 deaths. Again, in considering these numbers, it may be justly thought that the mortality of all amputations through the thigh is too high for sarcomas of the leg and the mortality of all amputations through the leg too low, for the amputations for sarcoma are always through the *lower* third of the thigh and through the *upper* third of the leg.

Comparing these results of amputations generally with those actually performed in 23 cases of sub-periosteal sarcoma, of which

14 are from my book and 9 from other sources, only one death is reported as due to the operation. In several instances, however, the report of the case appears to have been furnished within a few days after the operation, so that it cannot be definitely said that only one of the 23 patients died of causes connected with the operation.

Cures due to Operation.—Here again there is a notable absence of information, for in ten of the twenty-three cases the patients were not kept under observation. Of the twelve patients of whom notes were taken, one, a young man eighteen years of age, whose thigh was amputated on account of a chondrifying round-celled sarcoma of the inner tuberosity of the tibia of six months' duration, was alive and well a year after the operation; another, a man twenty-six years old, who suffered amputation of the thigh for the removal of a round-celled sarcoma of the upper third of the tibia at the end of two months, was well sixteen months later; while a third, a man of twenty years, with a calcifying mixed-celled sarcoma of the upper third of the tibia, for which amputation was performed after seven months, was alive and well at the end of two years after the amputation. These are the only records of well-doing for more than a very few months after operation. Nine patients are known to have died within a few months after the operation; in only one of them was there local recurrence of the disease, a case in which Gritti's amputation was performed for the removal of disease seated in the upper third of the tibia—surely an unwise proceeding. It cannot be certainly stated that death took place in all of these nine patients from malignant disease, but seven of the nine deaths were due to this cause. In the two remaining cases there was no post-mortem examination, but death took place three and six months respectively after the removal of the limb.

Conclusions.—In spite of the small measure of success which is recorded in the foregoing paragraphs, there can be little question that sub-periosteal sarcoma of the tibia and fibula will continue, and will continue rightly, to be treated by amputation.

When the disease is seated in the lower third of the leg, the limb may be amputated safely through the leg; when it is of the upper third, the amputation must be through the lower third of the thigh.

Recurrence of the tumour in the stump may be almost certainly avoided.

Although the present records show that there will certainly be many failures in the attempt to procure permanent relief from the disease, they also show that the operations themselves have not proved very fatal: more complete and extensive records may afford, and probably will do so, a moderate percentage of complete cures due to operation.

Clavicle.—I am not in a position to add anything to my former account of sub-periosteal sarcomas of the clavicle. The disease appears to be very rare. Still more rare are the cases in which an attempt has been made to remove it. Such an attempt was made in both the cases in my table, and in neither of the two was the operation fatal, although it was of necessity exceedingly difficult and prolonged. The patients were, however, both young, and to this fact, no doubt, may be ascribed in part the escape from death. Of the later result of the resection nothing is known in one case, but the other patient died not very long afterwards with recurrence of the disease, and perhaps affection of the lymphatic glands of the neck.

General Conclusions with regard to the Sub-periosteal Sarcomas.—Were it not for the hope that what is concealed in our ignorance and lack of information may be happier than that which is revealed by our present knowledge, the prospects of surgical treatment of sub-periosteal sarcoma would be most depressing. As far as our knowledge, derived from the cases in my former tables, and those I have added to them, goes, the results are 78 cases of sarcoma of the long bones, treated for the most part by amputation, a few by resection. Fourteen patients died from causes connected with the operation, and 29 of those who survived the operation died within a few months, most of them certainly of secondary disease. Only seven were known to be alive and well more than a year after the operation, and in six of the seven the period was either just over a year or between one and two years. The seventh patient was alive and well at the end of eight years.

There remain 28 cases of which the record is not complete, or which were only observed during a few weeks or months after the operation. Several of these were doomed to speedy death, for the disease had returned or appeared in some other part of the body, and was beyond the reach of operation. In the twenty or more patients lost sight of, lies buried for the present the hope of the successful treatment by operation of this formidable disease; for the short duration of life in six of the seven "cured" cases is not sufficient to permit of sanguine hope for the future. Taking the three years' term which has been prescribed in other sections as the limit which must be passed, ere a patient can be regarded as reasonably safe from a further outbreak of the disease, it will be seen that there is only one patient who can be considered as cured by operation. It is possible, however, that most of those patients who had survived a year and were in good health were really cured. In the study of the results of operation in the case of a disease so virulent as sub-periosteal sarcoma, it is only fair to assume that the term of probation, if one may so speak of it, may be shorter than that which is prescribed for disease of a less virulent and rapid type. With the exception of one case, that of an ossifying spindle-celled sarcoma of the lower end of the femur, in which death occurred (two years after amputation at the hip-joint) from malignant disease of the lungs, the recurrence or appearance of secondary disease took place within a few months of the operation, and nearly all the patients in whom the disease was fatal died within the period of a year after amputation had been performed.

I am afraid these are small crumbs of comfort, but, small as they are and few in number, we cannot do other than accept them gladly in the contemplation of a malady apparently so mortal as sub-periosteal sarcoma.

Central Sarcomas attack the same bones as the sub-periosteal sarcomas, and may be considered in the same manner and order as the sub-periosteal tumours.

The central sarcomas of the *Femur* occur, in the large majority of instances, in the lower end of the bone, sometimes affecting one condyle, but more often gradually replacing the whole of the cancellous tissue, expanding the cortical portion until it appears as if blown out by the disease within it. Adults are attacked far more frequently than children. The disease usually runs a slower course than sub-periosteal sarcoma, is not so often mixed with bone or cartilage, does not tend to affect the groin glands, and is comparatively rarely generalized. In every respect it appears to be a less malignant disease than the corresponding variety of sarcoma which takes its origin beneath the periosteum. The least malignant of the different varieties of central sarcoma is the myeloid or giant-celled tumour.

The central tumours of the *Tibia* have as great a tendency to affect the upper end of the bone as those of the femur have to affect the lower end. They pursue a slower course than the sub-periosteal tumours of the tibia, grow more slowly, have no tendency to affect the groin glands, apparently only seldom become generalized; and, in truth, are generally less malignant than the corresponding varieties of sarcoma of sub-periosteal origin of the same bone. They may attain a very large size and may destroy the upper end of the bone, and make their way into the joint.

The central tumours of the *Fibula* also affect its upper end, and appear to be less malignant than the corresponding tumours of sub-periosteal origin. But the number of cases which has been collected is so small that it would not be right to draw from them very decided conclusions.

The *Humerus* is almost always affected at its upper end, and a tumour is produced, which gives to the shoulder much the form of a leg of mutton. There is a wide difference in the course of these and of the sub-periosteal tumours; for, whereas the latter are very malignant and very rapidly fatal, the central tumours are of much slower growth, are not disposed to involve the surrounding structures, and have apparently no marked tendency to become disseminated. The instances of generalization appear to be for the most part instances of multiple sarcomas, rather than of dissemination proceeding from a single primary growth. The central tumours usually affect older subjects than the tumours of sub-periosteal origin. The close proximity of the growth to the shoulder-joint and to the trunk naturally renders treatment by operation more dangerous and less successful than it might be if the lower end of the bone were affected.

The central sarcomas of the *Radius and Ulna* almost invariably affect the lower end of the bone. They exhibit a modified malignancy, not tending to affect the lymphatic glands, or to produce secondary growths in the organs and tissues. They usually grow slowly, and are for a long period enclosed in the interior of the affected bone.

Central tumours of the *Clavicle* are very rare, and little can be said with regard to the course they pursue.

The account of the central tumours of the *Scapula* is included in that of the sub-periosteal tumours.

Methods of Operation.—In considering and estimating the various methods of dealing with the sarcomas of central origin, it must be borne in mind that there is a great difference in the relation which the tumour bears to the bone in many instances. Some of the growths are enclosed in cavities in the interior of the bones, which are smooth-walled, clearly defined, and from which they can be shelled out without the slightest difficulty. This is perhaps more frequently a condition of giant-celled tumours, and of tumours of the bones of the forearm and leg. Other central growths are certainly well-defined, but are at the same time only separable with difficulty from the surrounding bone. It can easily be seen that the treatment must be largely influenced by such conditions as these, quite apart from the importance and situation of the affected bone. It is not usually possible to distinguish accurately these relations until the tumour has been exposed, so that the treatment may need to be modified at the time of the operation. I have thought it well to preface what is to be said regarding the methods of operation with these remarks, because they apply to all central tumours of bone.

Three different operations have been practised for the relief of patients suffering from central tumours—enucleation of the tumour, resection of the affected portion of the bone, and amputation of the limb.

I shall not attempt to describe the last two operations, for the manner of the resection must obviously depend on the bone and part of the bone to be resected, and on the size and relations of the tumour. And the amputations for central tumours do not differ in any respect from those which are performed for disease of other kinds, the only essential point being that the incision should be well above the upper limit of the tumour. It may not, however, be amiss to remark, that resections for the removal of central tumours are likely to be less severe than resections for subperiosteal disease on account of the exact limitation of the central tumours (when they are suitable for resection), and the immunity of the surrounding structures.

Enucleation of a central tumour may be performed in the following manner:—After due preparation of the patient and of the part to be operated on, the circulation through the limb is arrested (if the tumour is situated in one of the bones of the limbs) by means of Esmarch's apparatus. A free incision is made in the long axis of the tumour over that part of it which is least covered by the soft structures. The shell of bone which covers the tumour may be very thin at this point, and egg-shell crackling may be evident. The bone is bared of the periosteum. An opening is made into the cavity which contains the tumour by cutting away with chisel or bone-scissors a portion of its wall, and the extent of the tumour and its relation to the cavity are investigated. If it is clearly defined, and, better still, easily separable from the surrounding bone, the entire tumour may be shelled out, or it may be scooped out with a Volkmann's spoon. Doubtful areas of the interior of the cavity may be treated with the actual or the thermo-cautery, or by the application of such a paste as that which is described in the chapter on the Breast (Bougard's paste). The cavity may be thoroughly washed out with an antiseptic solution, or dusted over with iodoform powder. When the Esmarch's apparatus has been removed, if there is much hæmorrhage it may be plugged with strips of lint or gauze. Bleeding vessels in the superficial wound are then tied, the wound is left open, and dressed in such a manner as the operator may choose. The cavity is allowed to heal up from the bottom, a process which of necessity occupies a considerable time when it is of large size. It must be borne in mind that the operation of enucleation may be unsuitable in cases of easily separable tumours, when the growth has been permitted to attain so large a size that the surrounding bone has been reduced to a mere shell, too thin and fragile to support the weight of the parts beyond.

Results of Operations: Humerus.—*Mortality of the Operation.*—The situation of the disease in the upper third of the bone, and its close connection with the natural tissues, together with the large size it usually attains, and the consequent destruction of the bone, are not favourable to attempts to enucleate central sarcomas of the humerus. Nor can resection be performed in many instances. The only treatment which appears to offer a reasonable prospect of success is amputation at the shoulder-joint. For the general statistics of this operation the reader must be referred to the section on sub-periosteal sarcoma of the humerus.

My table of Central Sarcomas (*Sarcoma and Carcinoma*) contains five cases of central sarcoma of the humerus, and to these I have added three more, making a total of eight cases. Resection of the upper end of the bone and of the tumour was performed in one of these, amputation at the shoulder-joint in the other seven. Three of the patients died of the results of the operation, including the patient for whom resection was performed. It has been already shown that the proportion of deaths is large for amputations at this joint for disease, and I have indicated the means which may possibly be successful in reducing the mortality. The total mortality of three in these eight cases is greater than the average mortality. The resection case was scarcely likely to do well, for the patient was sixty-three years old, and the operation was very extensive, including no less than the removal of the upper end of the humerus and the shoulder-joint. Both the fatal cases of amputation were due to hæmorrhage—in the one primary, in the other secondary, at the end of a week or ten days. I can recall a third case in which the patient died almost immediately after the operation from the same cause, but I have not sufficient notes of the case within my reach to include it in this list. These patients were young and apparently sound men; certainly neither of them suffered from arterial disease at the time of the operation, nor was there any condition of the blood which could account for so lamentable a result. I cannot but think that extreme care exercised in the avoidance of hæmorrhage ought to largely diminish the mortality of this operation.

Cures due to the Operation.—It is grievous to relate that not one cured case can be set off against the large mortality due to operation. Of the five patients who survived the amputation, three were lost sight of; in the fourth, recurrence of the disease occurred, and death resulted in a few months. The fifth patient was alive and well at the time of the last report, but that was only ten months after the operation. More accurate knowledge and a larger number of cases may perhaps enable us to take a more hopeful view of this disease; but at present it appears very formidable. Its habit of attacking the head instead of the lower end or shaft of the bone is in itself a sufficient reason why the treatment should be less satisfactory than the treatment of central sarcomas of the other long bones.

Conclusions.—The only conclusion which can be arrived at in the present state of our knowledge is that central sarcomas of the humerus are among the most dangerous of the sarcomas of the long bones. The operations practised for the cure of the disease are very fatal, and there is little evidence to prove that amputation at the shoulder is successful as a means of cure.

In the present state of our knowledge it is, however, premature to offer a decided opinion on the question.

Radius and Ulna.—*Mortality due to Operation.*—The addition of two cases which I have made to the seven reported in my tables gives a total of nine cases. The disease was treated by each of the three methods of which mention was made in the introduction to this section, namely, scooping-out, resection, and amputation. The scooping-out was only practised in two instances. Resection was performed in five cases, one of the five having been previously treated by scooping-out. The forearm was amputated in four instances, one of the amputations being performed on a patient who was previously treated by scooping-out and resection. The only death which was due to operation occurred from chronic pyæmia in a patient twenty-six years old, who had been treated by resection of the lower end of the ulna. Of the actual danger to be apprehended in cases of amputation of the forearm we can form a fair estimate from the numbers which have been given in the section on sub-periosteal sarcoma, where it was found that the best results were forty-two amputations, with two deaths. But there are really no means of discovering the relative danger of the three operations which have been practised for the relief of central sarcomas of the bones of the forearm. It is only possible to form a conjecture founded on observation of such cases as have come under our personal notice. Such an opinion as I could form would lead me to the belief that the operation of scooping-out the disease is the least severe of the three methods, that resection of the diseased portion of bone is the most severe, and that amputation of the forearm stands somewhere between the other two.

Cures due to Operation.—One of the nine patients died of causes connected with the operation, and four were lost sight of soon after the disease had been removed. The results in the remaining four cases were very satisfactory. A spindle-celled sarcoma was scooped out of the lower half of the ulna of a man twenty years of age, and the patient was quite well two years later. The forearm of a woman twenty-seven years old was amputated on account of a giant-celled sarcoma of several years' duration, and the patient was quite well four years after the operation. The lower end of the radius of a woman twenty-seven years of age was resected for the relief of a giant-celled sarcoma, and four years later she was well. And last, and perhaps best of all, a mixed-celled sarcoma was scooped out of the lower end of the radius of a woman thirty-five years old. The disease recurred, and the portion of the radius was resected. Again the disease recurred, and the forearm was amputated. Ten years later this patient was in good health.

Conclusions.—The evidence before us is of course very scanty, but, such as it is, it seems to point to the following conclusions. The malignancy of central sarcomas of the bones of the forearm is very modified. If the tumour is contained thoroughly within a cavity in the bone and can be easily separated from the wall of the cavity, an attempt may be made to scoop it out. If it cannot be scooped out, the diseased portion of the bone may be resected, provided the patient is likely to bear the operation. Either of these operations may be successful in curing the patient, but either may be followed by recurrence.

Recurrence of the disease should be treated by amputation of the forearm, which can generally be safely performed about the middle of the bones.

Clavicle.—*Mortality due to the Operation.*—My table contains only one case of central sarcoma of the clavicle. I have found two other cases, but even then the total is exceedingly small. Nevertheless, one of these three is of such great interest that it alone would entitle the clavicle to a separate consideration. In all three cases the operation which was practised was resection of the affected portion of the bone, which was the sternal end in two of the three, apparently the middle of the bone in the third. None of the patients died of the results of the operation, although it was a proceeding of very considerable magnitude in all, and fraught with the gravest danger and the greatest difficulty.

Cures due to Operation.—One of the three patients was lost sight of after the operation. The second suffered from recurrence two months after the removal of the diseased portion of the clavicle, and there is no note of the further course of the disease, or whether a second operation was performed. The tumour was composed partly of round, partly of spindle, cells. The third patient was a young man, nineteen years of age, who had for four and a half months suffered from a tumour of the clavicle of rapid growth. The disease had destroyed a part of the wall of the cavity in which it lay, and was adherent to the skin. It proved after removal to be an "osteo-sarcoma" (not containing any bone in its structure) originating in the interior of the bone. The operation of resection was performed by Valentine Mott, the American surgeon, in the year 1828, and the affected integument was removed together with the bone. The operation occupied a very long time, and was exceedingly difficult. But it was successful; for the patient recovered and remained well to the end of his long life. He died in 1883 at the age of seventy-three, when a dissection was made of the clavicular region and described by Dr. Porcher in the *American Journal of the Medical Sciences* (lxxxv. 146). Naturally, no microscopical examination was made of the tumour, for the resection was between fifty and sixty years ago, but I think there cannot be a reasonable doubt of its sarcomatous nature. Its origin in the interior of the bone, its protrusion from the cavity in which it grew, and the affection of the overlying skin, together with the rapidity of its course, all point to a malignant tumour. Indeed, the rapid growth and affection of the skin are evidence not only of malignancy, but of malignancy of a high order. The result of operative surgery must be regarded as peculiarly brilliant in this case, when it is taken into account that the time at which the operation was performed was a time in which there were no anæsthetics and no antiseptic surgery.

Femur.—*Mortality due to Operation.*—In addition to the nineteen cases of central sarcoma reported in my tables, I have collected fourteen more, which makes a total of thirty-three cases which were submitted to operation. The operations were the following:—Amputation at the hip, seven; amputation through the thigh, twenty-four; resection of the diseased portion of bone, two. The total number of deaths due to operation was ten; a large mortality when it is compared with the statistics of amputations for disease in the section on sub-periosteal tumours. It is distributed thus: amputation at the hip, three deaths; amputation through the thigh, five deaths; resection, two deaths. It will be seen that the excessive mortality occurred in the cases of resection and of amputation through the thigh. Probably in amputations through the thigh for central sarcoma the mortality will remain always high, on account of the necessity in the large majority of instances of performing the amputation through the upper third, so that the mortality of five in twenty-four operations may not be much larger than must be expected in the future. Of the two cases of resection little more can be said than that the fatal result was what might have been expected. It is evident that cases of central sarcoma of the femur are not suitable for resection, and one of these two cases was so peculiarly unfitted for the operation that it is difficult to comprehend the reasons which could have induced the surgeon to undertake it. The disease was situated in the upper epiphysis of the bone, and there was already secondary disease of glands and other parts of the body when the patient was examined after death. In the second case, the operation was performed by Billroth for the removal of disease of the lower end of the bone. It was found necessary to cut away six inches of the lower end of the femur, and the patient gradually sank and died of septicæmia. Professor Billroth says that the patient, a young woman, absolutely declined amputation, and he therefore excised the diseased portion of the bone. It must be imagined that he hoped she might recover from the operation, and, seeing that her limb was useless, would then submit to amputation. It will be perceived that there are not any cases in which the disease was scooped out of the interior of the bone, from which it may perhaps be inferred that the conditions were not such as to invite operators to attempt this method of dealing with central tumours of the femur.

Cures due to Operation.—Unfortunately, no fewer than sixteen of the patients were lost sight of after the operation. Deducting these and the ten patients who died from the results of operation, there only remain seven patients. Of the seven, three died within a few months, one with disseminated disease, the other two with recurrence *in sitû* and disseminated tumours. The history of the remaining four patients is satisfactory, although two of them cannot be claimed as cured. The first, a man twenty-eight years old, suffered amputation of the thigh for the removal of a round-celled sarcoma at the junction of the middle and lower thirds, and was well and free from disease nine months later. The second, a man twenty-nine years of age, had his thigh amputated for the removal of a giant-celled sarcoma of the lower epiphysis of ten months' duration and was quite well sixteen months after the operation. A woman, twenty-one years old, was well three years after her thigh had been amputated for the relief of a giant-celled sarcoma which had been noticed about fifteen months. In the two last cases the tumour was giant-celled, and the prognosis is better for giant-celled sarcomas than for those of any other structure; but this is not so with the case which is to follow. A young woman, aged nineteen, suffered amputation at the hip-joint for the removal of a spindle-celled sarcoma of the lower third of the femur which had been growing some six months. The glands in the groin on both sides were enlarged; but after the operation they subsided, and five and a half years later she was alive and quite well.

Conclusions.—It is much to be regretted that so few of the patients who recovered from the operation were kept under observation, for the results in the majority of the cases which were watched were satisfactory; but I think the following conclusions are justified by the evidence which is before us.

That central sarcomas of the femur are rarely, if ever, suited for the scooping operation.

That they are still less suited for the operation of resection.

That removal of the limb by amputation, while it is of necessity, owing to the fact that it must be performed in the large majority of instances either at the hip-joint or high up in the thigh, a very grave proceeding, offers the only reasonable chance of cure.

That, while there is clear evidence to prove that cure may result from the operation, there is not sufficient evidence at present to show in what percentage of cases a cure may be expected.

Tibia and Fibula.—*Mortality due to Operation.*—To the nineteen cases of central sarcoma in my tables I have added ten others, making a total of twenty-nine central tumours of the bones of the leg which were treated by operation. The operations which were performed were amputation of the thigh or at the knee in twenty-six cases; amputation through the leg in two; and "removal" of the disease (whatever that may mean) in one. Two of the amputations through the thigh were subsequent to scooping-out of the disease, but of that I shall speak presently. The mortality is very high, for no fewer than nine of the twenty-nine patients died of causes connected with the operation, eight after amputation of the thigh, and one after amputation of the leg. Compared with the mortality in the large number of cases of amputation for diseases of various kinds given in the section on the sub-periosteal sarcomas, the difference is immense. In the 265 amputations of the thigh there was a mortality only of about 12 per cent.; in the twenty-six amputations in this section, the mortality is about 30 per cent. I can see no reason why the mortality of amputations for central sarcoma should be so extraordinarily high, particularly as the amputation was performed in most of the cases low down in the thigh. It may partly be explained, no doubt, by the fact that some of the amputations were performed more than twenty years ago, and therefore before the improvement which has since taken place in surgery. Even allowing this, the mortality is still very exceptionally high. I am, however, inclined to think that there is no specific reason why it should be so in the treatment of this particular disease, and to regard the large mortality as fortuitous in this small total of cases and not likely to be repeated in the future.

It will be observed that there are not any cases of resection of the affected portion of the bone, nor need we be surprised at this. And there are only two instances in which an attempt was made to remove the disease by scooping it out from the interior of the bone. Neither of the two was fatal, but neither of them was successful, for it was necessary to amputate through the thigh in both at a later date on account of recurrence of the tumour.

Cures due to Operation.—Here again it is singularly unfortunate that sixteen of the patients were lost sight of after the operation (one having been kept under observation for seven months), which with the nine fatal cases makes a total of twenty-five cases, and only leaves four for our consideration. Of these four, two died at six and nine months respectively after amputation had been performed, but the cause of death was not known in either case. The remaining two patients were alive and well at periods of one year and five and a half years after amputation. The first was a woman, aged twenty-nine, whose thigh was amputated for the removal of a mixed-celled sarcoma of the upper epiphysis of the tibia. The second was a youth of eighteen years, whose thigh was amputated on account of a calcified sarcoma of the upper end of the tibia which had extended up the crucial ligaments to and into the lower third of the femur. The disease was known to have existed about two years and a half at the time of amputation. This is the only case which can be claimed as a cure by operation, for the period which had elapsed in the other case (twelve months) is too short.

Conclusions.—Again it must be admitted that it is not possible, from the evidence which is before us, to draw any large conclusions. But I think it may be said :—

That central tumours of the tibia and fibula can rarely be treated successfully by scooping them out from the interior of the bone.

That the operation of resection of the affected portion of the bone is not suitable to such cases.

That the only operation which is likely to be successful is complete removal of the limb just below or immediately above the knee, according to the situation and extent of the disease.

That a cure may be effected by amputation; but there is no evidence to prove in what proportion of cases a complete cure may be expected.

General Conclusions with regard to the Central Sarcomas.—The record of the central sarcomas is in many respects more satisfactory than that of the sub-periosteal tumours, but it is in some respects eminently unsatisfactory. With the cases which I have added to those in my tables, there is a total of eighty-two cases treated by operation. The operations were for the most part amputations, but there are several cases in which the disease was scooped out or the affected portion of the bone was resected. Twenty-three patients died of causes connected with the operation, and five of those who survived the operation died within a few months, not certainly, but probably from secondary growths or renewed outbreaks of the disease. Ten patients were known to be alive and well at least a year after the operation, and most of the ten were followed up for from two to many years after the removal of the disease.

The mortality due to operation I have already shown to be probably greater than it would be for an equal number of patients treated by similar operations for similar disease at the present time; and there is fair reason to believe that the number of cured cases here recorded is not by any means a fair index of the curability of the patients by operation. Two things in this relation are well worthy of notice: first, the small number of instances of local recurrence of the disease. So far as the record goes, there are only four: one after resection of the clavicle, one after amputation at the shoulder-joint for a central sarcoma of the head of the humerus, and two after amputation of the thigh for sarcoma of the lower third of the femur. The second point, and this is most unsatisfactory, is the large number of patients who were lost sight of after the operation. This occurred in more than half of the eighty-two cases. It is of course possible that this is a good rather than a bad omen. For in those cases in which the tumour rapidly recurs *in sitû*, or its removal is quickly followed by the formation of secondary growths in different parts of the body, the patient usually comes again under the observation of the operator. This was actually the case in many of the sub-periosteal tumours. There was not any necessity to search for the patients. They reappeared only too soon and could not be forgotten or lost sight of. Hence the smaller number of "lost" cases.

CHAPTER IV.

LYMPHATIC GLANDS.

Occasionally accounts are given of primary carcinoma of the lymphatic glands, but it is probable that in the large majority of such cases the primary disease has been overlooked. It is, however, possible that endothelioma may occur as a primary disease, and that the structure of the tumour may so closely resemble that of carcinoma that it may be impossible to distinguish between the two diseases.

Also descriptions are given from time to time of primary spindle-celled or round-celled sarcoma of the lymphatic glands, but there is not at present sufficient material from which to frame a really serviceable history of these diseases or to permit of an accurate idea of the consequences of surgical treatment on them.

The only primary malignant disease of the lymphatic glands with which we are in any large degree acquainted is the disease to which the name *Lymphadenoma* is often given, and which is often in this country termed Hodgkin's Disease. One or more of the lymphatic glands enlarges, and the glands of the neck are in the very large majority of instances those which are first affected. In a short time other glands in the vicinity of those which were first affected become enlarged. The diseased glands may remain for a long period separate from one another; but they usually coalesce, so as to form a continuous mass of considerable size, although the outline of the individual glands of which the mass is composed may be still plainly discernible, and they may be thought to be still separable tumours. In the same fashion the glands may appear to be separable from the surrounding structures, for their apparent mobility is always much greater than their actual mobility, in case an attempt is made to remove them. But experience shows—and my own experience in this matter accords with that of other surgeons—that even when they appear to be movable, and therefore removable, they are frequently so fixed to and intimately blended with the surrounding tissues, the muscles, fasciæ, large vessels and nerves by lymphadenoid growth beyond the capsule of the glands, that they can only be removed together with large portions of these structures, or that the operation for their removal is impracticable. The glands in different parts of the body, the groins, axillæ, mediastina, abdomen and pelvis, may be diseased either simultaneously with the first appearance of the enlarged glands in the neck or at a later date. The spleen usually becomes enlarged by the formation of tracts of adenoid tissue along the course of the splenic vessels; and secondary disease may occur in the skin, the intestines, and many organs and tissues of the body.

The large masses of (external) glands seldom suppurate or slough, but I have seen both these accidents. Death usually takes place from some intercurrent disease, pneumonia, peritonitis, disease of the kidneys, &c.; or the patient may become more and more debilitated and anæmic, and at length die exhausted. An increase of colourless corpuscles may be observed in the blood, but this is by no means a necessary symptom of the disease.

Little is known of the etiology of Lymphadenoma. Males are more subject to it than females, in the proportion of about two-thirds to one-third, and it is more common in childhood and middle adult age than at other periods of life, although no age is exempt from its occurrence. The persons who are the victims of the disease are often in a full average of general health at the time they are attacked; and if the course of the malady is slow (as it not unusually is), they may remain to all appearance healthy for many months, or even for years, in spite of the growing mass of glands.

Methods of Operation.—Although I will not undertake to say that large masses of glands in the neck, the axilla and the groin may not and have not been removed by the application of caustics, I will undertake to say that the treatment of the disease by this method is wholly inadequate. Even the comparatively slight secondary cancerous affections of the glands in the axilla are, I find, seldom treated by means of the caustic paste by Dr. Bougard; and if these are not suitable cases for caustic treatment, the large lymphadenomatous tumours in the axilla and neck are decidedly less suitable.

The only operative treatment which appears in any way adequate is the removal of the diseased glands with the knife. It is not possible to lay down detailed directions with regard to the incisions which should be practised in each case. Suffice it to say that they should be as far as possible in the long axis of the body, and should be so free as to afford a very complete exposure of the whole of the disease. Single incisions, however long, seldom suffice, and they must be supplemented by oblique incisions, and, if absolutely necessary, by transverse incisions. The dissection must be carried as close as possible to the enlarged glands, but if possible they should be shelled out with the fingers and the handle of the knife. If the surrounding structures are involved, the diseased portions of them must be removed. The wound, after bleeding vessels have been ligatured, should be carefully washed out with an antiseptic solution, the edges of the skin brought together, and the whole dressed in such manner as the operator is accustomed to employ. Whether the operation has been performed in the neck, the axilla, or the groin, great care should be taken after the operation to maintain absolute rest of the part until the first healing is accomplished.

Results of Operation.—Although several surgeons of eminence regard the operation of removal of the diseased glands in lymphadenoma as a justifiable operation (Holmes's *System of Surgery*, iii. 9, third edition), I cannot discover any instance in which a thoroughly successful removal has been accomplished. In Mr. Haward's cases, referred to by Mr. Holmes (*l. c.*), the disease recurred almost immediately. I have seen other cases in which the operation has been performed by bold and dexterous surgeons, but the disease had recurred in a very short time. I have myself attempted to remove a very large mass of glands which appeared before the operation to be sufficiently freely movable on the surrounding structures, but I was obliged to abandon the attempt after taking out several glands, on account of the implication of the large vessels and nerves and impossibility of completely clearing the neck without cutting away large portions of these structures. The patient recovered speedily from the partial removal, and there was not any ulceration of the integuments or protrusion of the malignant disease, but he naturally derived no benefit from what had been done.

Mr. Holmes, who recommends that the operation should be performed as "a justifiable experiment," speaks of it in these terms: "Yet it must be allowed that up to the present time the proceeding is an experimental one, that it is often exceedingly dangerous, and that after all it is very difficult to remove all the affected glands. In the case just referred to, the sterno-mastoid was cut across, and the whole neck, from the jawbone to the subclavian vessels and pleura, completely cleared out. Yet it was almost certain that some slightly enlarged glands were left under the clavicle; and although the operation was followed immediately by marked improvement in the general health, yet in a few months the disease recurred, and the child did not long survive" (*l. c.*).

It has been suggested that the prospects of success would be far greater if the disease were attacked at a very early period, before the glands in other parts of the body are affected, and before there is any probability of secondary affection of the spleen and other organs. There might then be as good a chance of affording a complete cure as there is when the malignant diseases of many other parts of the body are dealt with by operation, when they are still limited in extent and easily removable. The suggestion is certainly good; but at present the obstacle to acting on it is the circumstance that the diagnosis of the disease in these early stages is practically impossible. There are no means by which simple enlargements of the glands can be distinguished from those which are due to lymphadenoma, and it is often quite impossible for a long period to distinguish between strumous glands and lymphadenomatous glands. So ignorant are we at present of the precise characters of the disease in its earliest stages that we have no means by which we can certainly determine, even after the removal of the tumours, whether they are the tumours of lymphadenoma or not. Cases therefore of recorded cure of lymphadenoma by removal of the glands when they are still quite small must be regarded with suspicion, for the diagnosis may not have been correct.

I would not venture to say that a complete cure may not be procured by early removal of the disease; and the best chance appears to me to lie in the removal of lymphatic glandular swellings much more frequently and more freely at an early period of the enlargement than we are now accustomed to, in the hope that by removing the enlarged glands, in many different conditions of disease, we may perchance remove lymphadenomatous glands at so early a period of their existence that they may not yet have infected neighbouring or distant structures.

With regard to the developed disease, in which there are large masses of glands and the diagnosis is no longer uncertain, my opinion is that operation is very dangerous to the life of the patient and absolutely useless as a means of curing the disease. And I am the more disposed to speak against it because there is greater probability of benefit, and perhaps even of cure, by the internal administration of arsenic, either with or without the injection of arsenic into the affected glands.

CHAPTER V.

SPLEEN.

Of primary malignant disease of the spleen very little appears to be known, although secondary disease is not at all uncommon. From time to time accounts have been published of primary "cancer," but the actual disease has been round-celled or lympho-sarcoma in most instances in which a microscopical examination has been made. The tumour may become adherent to the neighbouring organs and affect the lymphatic glands in front of the vertebral column. Of the occurrence of secondary tumours in other parts of the body it is difficult to speak certainly, but there is at least one case on record to prove that many secondary tumours may be formed. The disease appears to attack adults, and to be of extremely rare occurrence in them, to present no certain signs by which it can be recognized as malignant disease, or even as a disease of the spleen. Under these circumstances it is not to be wondered at that there are scarcely any cases on record, even in this period of surgical activity, of removal of a primary cancer of the spleen.

The only instance of which I am aware of the removal of a "cancerous" spleen is that which was related by Von Hacker before the Deutsche Gesellschaft für Chirurgie in 1884. The spleen was removed by Billroth by median laparotomy from the abdomen of a woman, forty-three years old. She had been aware of the presence of a tumour for about seven years: during the last two years it had grown much more quickly, and during the last seven months had become movable in the abdomen. When the tumour was exposed it was found to be adherent to the omentum, the small intestine and the tail of the pancreas. In order completely to remove it, the end of the pancreas was cut off with a heated wire. The patient made a good recovery. But Von Hacker stated at the next meeting of the Society that the woman had died of recurrence of the disease in the course of a few months. The operation was performed on the 20th of March 1884, and the patient died in the autumn of the same year.

The original report of this case is not within my reach, so that I have been obliged to content myself with the abstract published in Canstatt's *Jahresbericht*, and am not able to say whether the disease was diagnosed correctly before the abdomen was opened, or whether the operation was undertaken under the impression that a wholly different disease was present.

I do not think it necessary to describe the operation for the removal of the spleen in detail, for two reasons. In the first place, it is very seldom likely to be performed for malignant disease on account of the extreme rarity of the disease. This, and not the strong improbability of being able to effect any good by the operation, will be the safeguard against its frequent repetition. In the second place, a mere description of the removal of an uncomplicated tumour, such as some of the innocent growths which have been successfully removed, would afford very limited assistance to a surgeon dealing with a complicated and adherent tumour, with perhaps associated affection of the lymphatic glands.

Those persons who are interested in splenectomy may consult Mr. Warrington Haward's paper in the *Transactions of the Clinical Society*, xv. 172; and Mr. Knowsley Thornton's paper in the *Transactions of the Medico-Chirurgical Society,* lxix. 407, where they will find a very complete list of all the operations which have been performed. The results, even for innocent affections, are not at all encouraging, and the operation has been, almost without exception, fatal when it has been performed for the removal of the spleen from persons suffering from leucocythemia.

CHAPTER VI.

BRAIN.

THE brain is rarely, if ever, the seat of primary carcinoma, but is subject to sarcoma and glioma (which may perhaps be regarded as a variety of sarcoma). The tumour may originate in almost any part of the interior of the skull, from the membranes of the brain, from the cerebrum, the cerebellum, the pons, medulla, or the crura; and in connection with the grey or white matter. Some of the tumours are circumscribed and more or less easily detached from the part from which they grow; but, in the majority of instances, they are diffused, and not only not easily separable from the brain substance, but not even always easily distinguished from it. They vary much in consistence and form, and are for the most part very soft and vascular. Of their rate of growth it is not very easy to form a just estimate, for some of them appear to have existed a long time without producing other than trivial symptoms, or perhaps no symptoms of intra-cranial tumour, while the symptoms of others of them are so confused with those of associated brain disease that they cannot certainly be separated. The cause of death is very variable: it may be due to the slow and steady progress of the tumour, or to intra-cranial inflammation, or to the effusion of fluid into the ventricles. Or some intercurrent disease, such as pneumonia, may prove fatal. Affection of the lymphatic glands of the neck does not occur, unless as a very rare accident. Nor is it usual to find secondary growths in other organs and tissues. Indeed, were it not for the anatomical structure of the tumours and their diffuse growth, which tends to incorporate the neighbouring structures, there might exist a reasonable doubt of the actual malignancy of these tumours of the brain. They kill, no doubt, but by reason of their situation, not by producing general sarcomatosis. I have been much struck, I confess, with these features of intra-cranial malignant tumours, and have been more than once inclined to question their malignancy. But I believe they are malignant, not only on account of the two characters which have been mentioned, but because they are sometimes associated with secondary growths. And further, it must be recognized that death ensues in many instances at an early period of the disease, long before the tumour-affection can be said to have reached its full development. Were sufficient time accorded, there can be little doubt that many of the intra-cranial tumours would be associated with similar growths in the lungs, the liver, and other organs.

Like all other malignant diseases, intra-cranial tumours are much more common in adults than in children, but their occurrence is by no means limited to adults.

The question of the removal of a tumour from the interior of the skull could scarcely have been seriously considered, however great the advance in operative surgery, were it not for the simultaneous advance in the diagnosis of intra-cranial disease which we owe in large part to Ferrier and Hughlings Jackson. There can be little doubt, also, that vivisection experiments have shown how much the brain will bear at the hands of operators, and how quickly and easily wounds of the brain which are made with care and rigidly treated will recover.

At present the surgery of tumours of the brain is purely experimental, and I am not at all disposed to believe that the removal of malignant tumours will ever become a recognized practice even among skilled surgeons. Dr. Hale White's paper, in the last volume of the *Guy's Hospital Reports*, and the exhibition of specimens of intra-cranial tumours at the Pathological Society, of which an analysis is given in the last volume of the *Transactions* (xxxvii. 1886), clearly show how few of the sarcomas and gliomas which have been discovered after death have been so placed or so circumstanced that they appeared suited for removal. Even those tumours which were situated at or near the convex surface of the brain were for the most part so diffused and so intimately associated with the substance of the brain, that it was difficult to discover where the morbid structure ceased and the healthy structure commenced. The records of many of the cases also showed how very difficult, if not impossible, it had been to arrive at a definite conclusion regarding the nature of the cerebral disease, and of its extent. Mr. Victor Horsley, in a recent paper in the *British Medical Journal* (1887, i. 863), objects to Dr. Hale White's reasoning against surgical interference in the majority of cases of intra-cranial tumour, that this opinion is derived from a study of the disease on the post-mortem table, when it has advanced so far as to kill the patient.

Mr. Horsley says: "For the full advantage to be gained from operative procedure it is obvious that the disease must be attacked in an early stage." Of course I cannot yet say how early it may be possible to diagnose the existence of a malignant tumour of the brain, but hitherto the diagnosis does not appear to have been made until the tumours have attained a considerable size. And, thus far, I have very little hope that the earliest diagnosis we are able to make with the assistance of our most able nerve-specialists will enable us to remove with anything approaching real success gliomas and sarcomas of the brain.

As the question of the removal of tumours of the brain is at the present moment exciting great attention, I shall offer such an account of the condition of the surgery of malignant cerebral tumours as may serve those who are interested in it.

Methods of Operating.—As Mr. Horsley has been most successful in his operations, I shall avail myself of his account of the method which he has found most advantageous. This may be found in its amended and complete form in the pages of the journal from which I have just quoted.

In the first place, the administration of morphine is recommended previous to the administration of chloroform, but the author points out that the chloroform must be administered very cautiously on account of the startling rapidity with which a patient who has roused up in the middle of the operation is sent off again in a moment with only a few whiffs of the drug. Further, the remarkable "proclivity" of children to the effect of morphine must be properly discounted.

The scalp-flap, instead of being crucial, should be semilunar and large, so outlined as to preserve in its attachment either the superficial temporal or occipital arteries uninjured, and should include the pericranium in its thickness. It is very important that the pericranium should not be separately raised up off the bone.

The bone is treated by first removing an inch disc with the trephine, and then cutting out a piece of the size required with a circular saw mounted on Bonwill's surgical engine. The separation is completed with very powerful bone-forceps. The fragments of bone removed may be replaced on the conclusion of the operation in cases in which it has been possible to preserve the dura mater, and may be included with good result between this membrane and the scalp-flap.

If the dura mater is not involved in the disease none of it need be removed, but in cases in which it is affected, the diseased portions must be freely excised. When the implication of the membrane is recent and slight nothing is noticed but an increase of its vascularity, but when the affection is more advanced it is yellowish or even dirty red in colour. The incision is made in the dura mater with a scalpel and increased, as far as may be needed, with blunt-pointed scissors. The vessels are ligatured as they are reached, and, if possible, before they are divided.

The brain may be freely incised and as much of it as necessary removed to expose and remove the tumour. Hæmorrhage is guarded against, first, by the administration of morphine before the inhalation of the chloroform; second, by raising with great care the pia mater from its surface and from between its sulci; third, by always making the incisions in its substance exactly vertical to its surface. The operator need not hesitate to remove even a wide area of the brain-substance in the vicinity of a malignant tumour, just as he would do in the removal of a malignant tumour of the superficial parts of the body. If hæmorrhage occurs during the operation, it may be arrested by plugging the wound for a few minutes with a fragment of sponge or gauze.

When the disease has been removed and all oozing has ceased, the flap is laid down in place and its edges are united by sutures placed at frequent intervals. A drainage-tube is inserted at the most dependent point as the patient lies in the recumbent posture. The tube is left in for twenty-four hours and is then removed, unless there is such extreme tension as to render it expedient to retain it, or even to introduce a probe beneath the flap in order to let out the fluid which may have collected there. So far, however, from removing this fluid, and relieving the tension which almost invariably exists to a limited extent, Mr. Horsley considers that the presence of the fluid is desirable, in order to maintain a certain degree of pressure, so that protrusion of a hernia cerebri may be prevented.

Union is expected to take place by the first intention, and the patient may be out of bed at the end of ten days, if all goes well.

With regard to the method of preparing the skin before the operation and the general dressing of the wound, the day before the operation the patient's head is shaved and washed with soft soap and then ether. Next, the position of the lesion is ascertained by measurement and marked upon the scalp. The head is then covered with lint soaked in 1 in 20 solution of carbolic acid, oiled silk and cotton-wool, being thus thoroughly carbolized for at least twelve hours before operation. Mr. Horsley uses strict Listerian treatment, meaning by that expression the use of the carbolic spray, 1 in 20 carbolic lotion, and, for the first few days at any rate, dressings of carbolic gauze. The dressings are usually changed at the end of five to seven days, and, if the wound is healed along its length, the Listerian dressings may be dispensed with and replaced by boracic acid powder. The stitches are removed at the end of a week or a little later.

For further details the reader is referred to the original papers in the *British Medical Journal* of April 23, 1887, and of October 9, 1886.

Results of Operations.—The number of instances in which a malignant tumour has been removed from the interior of the skull is at present so small that it is impossible to draw any reasonable conclusions regarding the probable mortality of the operation itself, or of the possible benefits which may be derived from it. In the first case reported by Messrs. Bennett and Godlee in the *Transactions of the Medical and Chirurgical Society* (lxviii. 1885), a glioma the size of a walnut was removed, and the patient died in the course of four weeks of septic meningitis. Mr. Horsley removed a glioma, weighing between four and five ounces, from the brain of a man thirty-eight years old: the patient made an excellent recovery, but died six months later from recurrence of the disease. He has also removed another tumour of the same weight from the brain of a man, thirty-seven years of age, but the nature of the growth is not stated in the table, and the time which has elapsed since the operation is not sufficiently long to allow an opinion to be expressed with regard to the probable result.

It is quite certain that the operative surgery of malignant tumours of the brain will not be allowed to rest here: Within the period of a year several, if not many, operations for the removal of such tumours are sure to be performed. It is of the utmost importance that an account of every one of these operations shall be made public, not only in reference to its immediate but to its remote result. And not only the instances in which the tumour was actually removed, but those even more instructive cases in which it is found necessary to abandon the operation on account of its impracticability. I have already said that, judging of the question from a study of the disease and from general pathological grounds, I have little hope of the success of operative surgery against malignant tumours of the brain. And I now look with deep interest to see how far the results of direct experiment will confirm or falsify this view.

CHAPTER VII.

THE EYE.

In this chapter I propose to restrict my remarks to intra-ocular tumours, and only so far to speak of epibulbar tumours as they are distinctly of intra-ocular origin.

Two distinct forms of malignant tumour originate in the interior of the eye, glioma of the retina, and sarcoma of what is termed the uveal tract (which consists of the choroid, the ciliary processes, and the iris). Both of these growths are included among the sarcomata, but they pursue so different a course that it is necessary to study them separately, in order to arrive at a correct conclusion with regard to the character of the operation which should be performed and of the probable chances of a successful issue.

Glioma of the retina is usually in its origin a circumscribed tumour, and may grow from the outer or the inner surface of the membrane. It occurs so invariably in children that it is scarcely known in persons over twelve years old, and is rare in children after the first five or six years of life. It forms an uncoloured tumour, but can generally be distinguished at an early period with the ophthalmoscope. At a very early period of its course it attacks the optic nerve, so that the nerve is frequently affected even when there is yet but a very small tumour within the eye. This is of course more likely to occur in association with tumours situated at the back part of the globe. Either before or after the affection of the optic nerve, the tumour may make its way through the sclerotic or the cornea, and in time produce a fungous mass, which may fill the orbit and extend beyond it into the surrounding structures. In consequence of its early exit from the globe by way of the optic nerve, and of its great tendency to follow the course of the nerve, glioma may creep through the optic foramen into the cavity of the cranium, where it may form a large mass in the vicinity of the chiasma or may affect the membranes of the brain, and extend to the medulla, and even to the spinal cord before it causes death. In the same way, it may extend from the first affected eye by way of the chiasma to the other eye, where a tumour similar to the first may be developed. But this does not appear to be the explanation of the large number of instances in which both eyes are affected. In many cases the two eyes are simultaneously or nearly simultaneously affected; and in some cases, not only is there no evidence, microscopical or other, of affection of the nerves between the two eyes, but the nerves have been found to be actually atrophied. The assumption, therefore, is that in these two classes of cases the tumours are due to the same cause and are of equal standing, just as in some instances both breasts are simultaneously attacked by carcinoma. The progress of the disease varies in different cases within certain limits. The bones of the skull may become the seat of numerous tumours, either by direct continuity or perhaps through the vessels of the diploë. The lymphatic glands in front of the ear, behind the jaw, and in the neck are not infrequently affected. Secondary deposits are occasionally found in the liver and other parts of the body, but this is an exception to the general rule. Left to itself, the disease is invariably and usually rapidly fatal, for some of the patients die within a few months of the first occurrence of symptoms of ocular disease, most of them die within a year or a year and a half, while very few survive for three or more years.

Sarcoma may originate in any part of the uveal tract, but is much more common in the choroid than elsewhere. It may be round- or spindle-celled, uncoloured or pigmented. The pigmented or melanotic sarcomata are more numerous than those which contain no pigment. The first respect in which sarcoma differs from glioma is in its relation to age; for, although it may occur during childhood, it is much more often found in adults, and the cases become more numerous in proportion to the age of the patient, after thirty or thirty-five years old. The tumour itself has a tendency to fill the globe, and sometimes does so quickly, but in other cases the growth is very slow, so that three or four years may elapse before the bulb is filled and its fibrous tunic perforated. Perforation occurs in the large majority of cases if the disease is left to itself, but the outbreak does not take place at or in connection with the perforation of the sclerotic by the optic nerve. The orbit in this, the second, stage of the disease becomes affected, and is sometimes the seat of numerous small nodules, which are separated from each other by what appears to the naked eye to be a distinct interval of healthy tissue. From these nodules other similar nodules may form in the periosteum and bones of the orbit, and may extend into the brain, but growths in the brain are not common. The lymphatic glands are never affected as they are in many cases of glioma, although in the generalization of the disease some of the distant glands may, like other organs, be the seat of secondary affection. On the other hand, generalization is far more frequent than in the case of glioma, the liver above all organs affording a nidus for the secondary growths, which may occur also in the stomach, the skin, heart, kidneys, bones, the lungs and other parts. Dissemination of the disease is so common and occurs so early that the removal of the eye, even when the tumour is quite small and of apparently recent occurrence, is, more often than not, futile as a means of saving the life of the patient. The number of instances in which no operation is performed is so small that it is difficult to arrive at a correct conclusion regarding the natural duration of the disease, but it is probably longer than that of glioma if a large number of cases of each disease could be compared.

Methods of Operation.—*Iridectomy.*—In those cases in which the tumour is of very small size and is distinctly limited to the iris, it may be removed by an iridectomy, performed in the ordinary manner, care being taken to remove not only the tumour, but a sufficient area of the surrounding normal tissues.

Enucleation.—The lids having been widely separated by means of a speculum and the patient well under the influence of an anæsthetic, the conjunctiva is incised all round the outer margin of the cornea, and at a very short distance from it. The rectus tendon which lies to the left side of the operator (external rectus of the left eye, internal rectus of the right eye) is divided, and the stump of the tendon is seized with a pair of forceps in order to permit the operator to move the globe freely in all directions. The lower rectus is next divided, then the superior rectus. The eye is now rolled on its vertical axis towards the left side so as to bring into view the optic nerve and structures at the back of the eye. These are divided, and the globe is still further rolled over until the two obliqui can be reached, and last of all the remaining rectus tendon. After the removal of the eye, the stump of the optic nerve and the contents of the orbit must be examined with the greatest care for new growth, and such portions of them as are in the least degree suspicious removed.

In this operation no vessel usually requires ligature; the hæmorrhage ceases speedily on the application of cold water, allowed to fall in a gentle stream from a sponge held above the wound. A dressing of sanitas or carbolic oil, or some other antiseptic, is laid upon the cut surface and covered with cotton-wool. Outside the lids, which are closed, a lump of wool is again placed and bandaged so as to maintain pressure sufficient to arrest hæmorrhage from small vessels and capillaries. The recovery is very rapid.

Extirpation or Exenteration of the Orbit.—The term extirpation has been employed in different senses, sometimes synonymously with enucleation, sometimes for the removal of tumours of the orbit, in which the eye itself is left untouched, sometimes synonymously with exenteration (Arlt). I prefer the term exenteration of the orbit, because it admits of no doubt of the extent of the operation, the word "exenteration" having the same signification as "evisceration." Arlt's method of performing it is as follows:—When the patient is thoroughly under the influence of anæsthetic, the outer commissure of the eye is split as far as or beyond the margin of the orbit. The lids are raised off the tumour or eyeball, the fold of mucous membrane which unites them to the globe is divided as far from the globe as may seem desirable, and they are then turned back upon the cheek and forehead and fastened out of the way until the operation is completed. The growth or contents of the orbit are now seized with a vulsellum forceps, drawn forwards and separated from the wall of the orbit with the aid of a blunt elevator, commencing along the outer wall. This can be done without difficulty when the tumour is not adherent at the sides. The separation is performed on all sides until the optic nerve and the attachments of the muscles at the back are reached, when they are all divided with a strong pair of slightly curved scissors.

If the periosteum is adherent to the tumour and it is considered expedient to remove it, it must be incised at the margin of the orbit, where it adheres firmly to the bone, with a sharp scalpel, after which it is raised up from the bone in the same manner as the contents of the orbit were separated, and is removed either in whole or part.

The hæmorrhage caused by the operation is seldom serious, and can usually easily be stayed by the application of cold water in the manner described in the paragraph on enucleation. Should this not suffice, it may be necessary to plug the orbit or to apply lint soaked in the tincture of the perchloride of iron or in the solution of the subsulphate. The dressing most suitable in these cases is one or two long strips of lint, soaked in sanitas or carbolic oil or lotion, and laid in the cavity so as to fill it. The amount of pressure which is exercised by the strips must depend on the tendency to hæmorrhage. The lids are closed, as in the last case, and the wound of the external commissure is brought together with two or three sutures. A pad of cotton-wool is placed over them, and kept in place with a bandage.

Caustics.—Even the most ardent advocates of caustics are not, so far as I am aware, in the habit of employing them for the destruction of eyes containing malignant tumours in their interior, although they have been used in certain cases in which the intra-ocular tumour has grown through the tunics of the eye and has become a fungous mass. Their use has, however, been almost restricted to cases in which the disease has affected the deeper structures of the orbit, particularly the periosteum and bone. They are much more frequently employed in operations for recurrent disease, and usually as an adjunct to removal of the disease by the scissors or the knife. In England caustics are employed for this purpose more often than in France or Germany, and the material which is in favour is chloride of zinc. One part of the chloride is mixed with four parts of meal, and with as much tincture of opium as the operator thinks desirable to allay the pain of the application, and is rubbed into a paste of the consistence of honey. This paste is spread on strips of linen, which are applied to the diseased parts.

The actual cautery is sometimes employed for the same purpose.

In the course of time, which may be as long as several weeks or even two or three months, the portions of bone separate and come away.

Results of Operations.—*Mortality of the Operations.*—The danger of death after iridectomy for malignant tumour is so trivial that it need not be taken into account in considering the desirability of removal of the disease.

The same may be said of simple enucleation of the eye: the operation is almost without danger to life, although occasionally a patient dies, as it were, by accident, as he might do after the removal of the last phalanx of a finger or some similar operation.

Exenteration of the orbit is of course a more severe proceeding, and should not be undertaken lightly. It is, however, exceedingly difficult to form a correct estimate of the mortality which results from the operation, owing to the loose fashion in which the term extirpation has been used. Many of the so-called extirpations are in reality exenterations, and many of the operations for recurrent disease within the orbit are exenterations. Taking fifty-three cases of extirpation, exenteration, and removal of recurrent tumours from the orbit—operations varying probably in extent, and some of them involving not only the removal of the contents of the orbit, but the application of caustic to the bony wall—four deaths are recorded. One of the patients died of apoplexy the day after the removal of a recurrent tumour, and the death therefore need scarcely be attributed to the operation, but may be regarded as accidental. The actual mortality would then stand at three in fifty-three cases, or about 6 per cent.—by no means a large mortality when the extensive nature of some of the operations is taken into account, and the close proximity of the cerebral membranes and the brain. The three deaths were due to hæmorrhage, to erysipelas, and to septicæmia.

The relative danger of operation by instruments and the application of caustics cannot be estimated, for reasons which are apparent from what has been said with regard to the circumstances under which caustics have been employed.

Cure of the Disease by Operation.—In order to estimate the value of operations for the cure of malignant disease of the eye, it is necessary to consider operations for glioma and sarcoma separately.

Fuchs has collected and tabulated with the most praiseworthy care no fewer than 259 cases of intra-ocular sarcoma (in his work on *Sarcom des Uvealtractus*, Vienna, 1882), and these afford an admirable material for studying this part of the subject.

Of sixteen cases of sarcoma of the iris, fourteen were treated by operation, four by iridectomy, ten by enucleation. The four cases of iridectomy were kept under observation, with the following results:—Recurrence took place in one of them shortly after the operation, and no further operation appears to have been undertaken; one was well at the end of six months, one at the end of twelve months, and one at the end of three years. The result must be regarded as good, and may no doubt be attributed to the fact that the tumour was in each instance very small, although in the last case it was known to have existed many years before the operation, and had given rise to occasional attacks of iritis. Five of the ten cases of enucleation were not followed up after operation. Of the remaining five, two were well at the end of six months, one at the end of eighteen months, one at the end of two years, and in the fifth the operation is said to have been followed by phlegmon of the orbit, but whether the patient recovered or died the report does not say. The results which can be claimed, therefore, in the nine cases of sarcoma of the iris which were kept under observation is, that there was no recurrence of the disease in three of them at intervals respectively of eighteen, twenty-four, and thirty-six months; and that three of the others were well after six months, and one more after twelve months.

Of twenty-two cases of sarcoma of the ciliary processes, twenty-one were submitted to operation—in every instance enucleation of the eye. None of the patients died of the operation. A further account is given of ten of them. Of these, three were known to have died or to be suffering from secondary disease: one at the end of two years and a half had nodules in the liver and skin; one died at the end of a year, it was supposed from sarcoma of the other eye; and the third died of recurrence in the orbit. A fourth patient died several years after the operation, but the cause of death was not known, and she may be fairly counted as a success due to the operation. The remaining six patients were well at periods of nine, eighteen, twenty-four, thirty, thirty-six, and sixty months: two of them, therefore, full three years after the operation had been performed—an exceedingly good result.

The cases of sarcoma of the choroid are by far the most numerous, and are 221 in number. Five of the patients were not submitted to operation, and the further history of eighty-eight is not known. Of the remainder, four died from the effects of the operation—or rather three died from the effects of the operation, and a fourth died of apoplexy on the day after the removal of a recurrence; seven died at various periods after the operation from unknown causes, and although most of these must probably be considered to have died of sarcomatous disease, this certainly cannot be said of two of them, for one of the two died three years after the operation, and the other ten years after, apparently of apoplexy, when he must have been eighty-six years old. Ten patients died with local recurrence, either associated with tumours in other parts of the body, or not. Thirty-four died with metastases, or were presumed on fair evidence to have done so. Twenty-four were alive at various periods after the operation, with disease either recurrent or in some other part of the body. Two of these deserve particular mention, for the recurrence took place in one of them after a lapse of seven years, in the other after a lapse of nine years. Also, in discussing these recurrent cases, it must be borne in mind that some of the recurrences may have been submitted to operation after the report was made, but the fact of a second operation is not mentioned. Some of them might probably be correctly classified as cases of which the complete history is not known. Last, there are forty-nine patients who are reported to have been alive and well at various periods after the operation. But not nearly all of these can be claimed to have been cured of the disease. In nine of them only three or four months had elapsed since the operation; and in no fewer than twenty-five cases only a year had passed without recurrence. In five instances eighteen months were well passed; in three instances two years and a half; in five cases four years; in two cases five years; six years and a half in three instances; seven years and a half in two; and nine years in two. To these must be added the case of the old man who died ten years after the operation of apoplexy; and I myself should add the two cases in which the recurrence did not take place for seven and nine years respectively, for this is no recurrence in the ordinary sense of the word. I should therefore say that seventeen persons were cured by the operation, in so far as they lived free from the disease for periods of at least four years after it had been performed, and these seventeen persons must be compared, not with the total number of 221, but with the total of 132 of which the result is fairly known.

I have drawn up the above numbers myself from Fuchs's tables, because I am not satisfied with the manner in which he has treated them. He has estimated the percentage of recoveries, of metastases, of recurrences, &c., on the whole number of cases tabulated, whereas the further history of eighty-eight cases was not known. Fuchs has, however, drawn attention to several very important and interesting circumstances in connection with the conditions affecting operation. First, with regard to the liability to local recurrence. Recurrence is scarcely to be feared if the disease is operated on when it is still confined *within* the eye, but the danger becomes considerable if the fibrous tunics of the eye are perforated and the tumour has made its way into the surrounding tissues of the orbit. The period at which the recurrent tumour appeared in thirty-one cases was within twelve months in eighteen of them, and in eleven of these within six months, after the operation. Second, the proportion of cases in which generalization took place in the first and second stages of the disease was almost as great as in the third, when the disease had extended into the structures of the orbit. And, so far as the relation of time to generalization is concerned, eight cases of generalization took place within six months of the first appearance of the disease in the eye, eleven cases between six and twelve months, and fifteen cases between the first and second years; so that thirty-four out of forty-five cases of generalization occurred within two years after the period at which the disease was discovered. It is probable, therefore, that operation is not a great safeguard against metastases unless it is performed at an early period of the disease.

Another point to which Fuchs draws attention is the result of operations practised for recurrence of the disease. Naturally, such operations cannot be regarded as offering the same prospect of cure as the original operation, when the disease was perhaps confined within the eye; but Fuchs mentions one case in which two small nodules were removed from the orbit two years after the enucleation of the eye, again three years later a single nodule, and the patient was well and free from disease three years after the last operation. Unfortunately, this is the only instance to which he is able to point of long-lasting freedom from disease following operation for recurrent sarcoma.

Although there is no monograph on glioma which contains so large a number of cases or such elaborate tables as those of Fuchs, there are two sources from which more than a hundred cases can without difficulty be put together—the excellent monograph on *Markschwamm der Netzhaut*, by Hirschwald (1869), and a paper by Vogel in the *Archives of Ophthalmology* (viii. 374; 1879). The monograph is the result of a study of seventy-seven cases which the author had seen or collected; and the paper contains an account of many more cases, but only a certain number of them are so reported that they can be used.

Of the 115 cases taken from the two papers, twenty-one were not submitted to operation, and a very good reason for this appears in the fact that no fewer than eleven of these cases were instances of glioma of both eyes. This does not comprise the whole number of cases of double glioma, for in another patient there was, with recurrence in the first orbit, formation of glioma in the other eye; in four of the patients who were known to have died after operation the second eye was affected at the time of death; and, strangely enough, one of the patients who is placed in the class of those who were known to have been well and free from disease after operation had glioma of the second eye; this was removed, and a year after the second operation the child was quite well.

Twenty-three patients were reported well and free from disease at various periods after the operation, but in nine of these cases the period of observation had only extended over six months, or even less. Of the longer periods, three counted eighteen months, one two years, one three years and a half, one four years and a half, and two six years. There are therefore only four patients who were known to have been alive and well at least three years after operation. The patient who lived four years and a half and was still quite well deserves special mention, because his was a case in which a recurrent growth was removed from the optic nerve, and might therefore have been regarded almost as a hopeless case, so rapidly does the disease extend along the nerve.

Recurrence followed the operation in six cases, but their termination is not recorded; they must in all probability be classed as fatal cases.

Although none of the patients appear to have died from the effects of the operations themselves, no fewer than thirty-eight are known to have died afterwards, the cause of death being either recurrence or affection of the lymphatic glands, or of the brain, or bones, or other parts of the body. The final result was not known in twenty-seven of the cases in which operations had been performed. The total proportion of cured cases is therefore four in sixty-seven of which the results are known.

Hirschwald draws attention to the early appearance of the recurrent tumours in cases of glioma. In twenty-four cases, recurrence took place within four weeks after the operation in no fewer than twelve; within two months in nine; and in the remaining three cases within three months; so that there may be said to be little to fear from recurrence *in situ* if the patient is free from any sign of new growth three months after operation. The rapidity with which the disease extends from the interior of the eye along the optic nerve is the cause of this early recurrence, and the recurrent tumour is found, as might be expected, in and around the stump of the optic nerve. In spite of the liability of the lymphatic glands to become secondarily affected, there is much less liability to affection of distant parts of the body in connection with glioma than with sarcoma of the eye; and, consequently, if the operation is successful in arresting the local extension of the tumour, and there is no simultaneous affection of the other eye, a complete cure may more reasonably be expected from operation in cases of glioma than in cases of sarcoma. Operations for recurrent disease are, as has been said, very rarely successful; indeed, Hirschwald was not able in the seventy-seven cases which he put together to point to a single instance in which such an operation had been successful, and he therefore laid down the law that such operations are absolutely hopeless. Since the period at which his monograph was written, two cases, at least, appear to have been successfully treated; and, although that is a very small number, it offers a faint hope that early and free removal of recurrent disease may occasionally be rewarded with success.

Conclusions.—*First, in Regard to Sarcoma.*—Small and circumscribed sarcomas of the iris should be removed by the operation of iridectomy. If the disease recurs, the eyeball should be enucleated.

Large sarcomas of the iris and sarcomas of the ciliary processes and the choroid should be treated as early as possible by removal of the eye. If the disease is limited to the interior of the eye, and there is no perforation or appearance of perforation of the fibrous tunics, the prognosis is good so far as the prevention of recurrence is concerned, but only moderately good so far as the cure of the disease is concerned, on account of the very early period at which generalization often occurs.

Sarcomas which have broken through the fibrous tunics into the tissues of the orbit must be removed by very free extirpation of the eye and the disease outside it, but better still by exenteration of the orbit.

Recurrent disease should be freely removed by the same operation; and, if the walls of the orbit are affected, it is well to treat them by the application of chloride of zinc.

Even when there are distinct symptoms of generalization of the disease, it may be expedient to remove the disease of the eye or orbit in order to prevent, if possible, the distressing protrusion and ulceration which occur in the later stages.

Second, in Regard to Glioma.—Glioma limited to a single eye should be removed as early as possible by enucleation of the eye, and the optic nerve should be divided as far back as possible with a pair of curved scissors. If there is any reason to suspect that the nerve is already affected, it is right to exenterate the orbit. Indeed, I am not sure that it would not be better to make a general rule of exenteration of the orbit in all cases of glioma except in those cases in which the disease is seated quite at the anterior part of the eyeball.

Recurrent disease should be treated by exenteration.

If both eyes are affected, it is better not to remove them or either of them, although the operation may be regarded as justifiable in order to prevent the occurrence of fungous protrusion and the pain and misery which are associated with it.

Symptoms indicating the presence of a tumour of the interior of the skull contra-indicate any attempt to remove the disease within the orbit.

CHAPTER VIII.

EXTERNAL EAR.

A FEW rare instances of sarcoma of the outer ear have been recorded in surgical literature, but the disease is so rare that it need not be considered from an operative point of view.

The only variety of carcinoma which is comparatively frequent in this situation is the squamous-celled, or epithelioma; indeed, it is doubtful whether the ear is ever the seat of any of the other varieties. But it is probable that both the common form of epithelioma, and that peculiar variety to which the name "rodent ulcer" has been given, occur, although the rodent ulcer is much rarer than the ordinary epithelioma. I have not myself ever made a minute examination of a case of primary rodent ulcer of the external ear, nor can I place my hand on an account of such an examination at the present moment. But I do not know how to explain the great discrepancies which exist in the descriptions of the course of cancer of the ear, or the great differences which have been observed in the duration and characters of certain of the recorded cases, otherwise than by assuming that two quite different varieties of the disease have been observed. In all probability the case of a commander in the Navy, related by Mr. Bryant (*Medical Times and Gazette*, 1872, i. 2), was one of rodent ulcer. The patient was seventy-four years old, and the disease, which affected the whole of the pinna, had existed for at least eight years. There was not any affection of the lymphatic glands. The ear was amputated, no recurrence took place, and the patient was alive and well some years after the operation.

The ordinary epithelioma of the ear attacks men much more frequently than women, and is a disease not only of adult age, but of advanced adult age, occurring scarcely ever in persons under forty years of age, and appearing much more frequently at a later period of life. The primary outbreak of the cancer may be at any part of the external ear, but more commonly affects the outer than the occipital aspect. This is what might be expected from the greater exposure of this surface. The influence of exposure in the production of the disease is further indicated by the fact that it is more frequent in men who follow occupations which expose them to the weather. In not a few instances the occurrence of the cancer has been preceded by long-standing eczema or other cutaneous affection. The cancer, commencing as a crack, a fissure, ulcer, or wart, soon ulcerates, spreads slowly over and into the substance of the pinna, and gradually destroys it. The cartilage resists the progress of the new growth, and is sometimes left projecting in the middle of the ulcer. From the pinna the disease may reach the adjacent portion of the scalp, or spread into the auditory meatus, and so reach the middle ear. The lymphatic glands behind and below the jaw are liable to become affected, when the prognosis becomes infinitely more grave. Of the occurrence of secondary growths in other parts of the body, nothing can at present be said, for there is really no evidence before us. In the majority of cases the disease is by no means rapid in its course, and the shortest duration which I have yet found recorded, from the first appearance of the malignant ulcer to the death of the patient, is one year. In other instances the duration has been from one to two or three or more years, even when the cancer was the ordinary variety of squamous-celled carcinoma. The later stages are often associated with considerable radiating pain up the back and side of the head, with deep-seated ulceration of the ear and side of the head, and with enlargement and ulceration of the lymphatic glands.

The course of the malignant ulcers which are probably "rodent" is marked by a much slower progress and destruction of the ear, and by absence of affection of the lymphatic glands.

Methods of Operation.—Cancer of the ear has been removed by many different methods. It has been destroyed by means of caustics; removed with scissors, knife, écraseur, galvano-cautery loop; scraped away thoroughly with a sharp spoon, and the raw surface treated with caustics. But by far the largest number of operations appear to have been performed with the knife. The operation, too, has varied from the mere removal of a small portion of the external ear to the complete cutting off the ear, the removal of a larger or smaller area of the surrounding integument, and the dissection of the lymphatic glands.

The mere removal of a small portion of the ear, such as the lobe or a part of the helix, does not require a description; nor is it necessary to describe the larger operations, which include the removal of the whole ear and perhaps of some of the adjacent integument. They are simple incisions, followed by insignificant hæmorrhage, and, in the majority of instances, by no serious symptoms. Many of the patients are, however, very old, and it is desirable to spare them, as far as possible, loss of blood, and to guard against erysipelas and other wound-poisons, to which their weak condition may render them an easy prey. On the very old, the removal of the disease may be effected with the galvano-cautery; and after the operation, whether on young or old, the wound and the surrounding parts must be thoroughly cleansed, the external meatus filled with iodoform powder or with a very narrow strip of iodoform gauze. Before the operation every care should be taken to cleanse the ear and the surrounding parts—a precaution which is too often neglected on account of the comparative insignificance of the operation, but which is even more necessary here than in most other parts, on account of the close proximity of the hair and the conformation of the external ear, which tend to harbour dirt.

On the very old and feeble, the removal of the disease may also be performed by means of caustics, of which caustic potash, Vienna paste, or Bougard's paste may be employed. I am bound to say I cannot offer any instance of a patient permanently cured by the destruction of the disease by means of caustics. Bougard does not appear to have had any case under his care. In several of the instances in which caustics have been used there has been recurrence, which has either proved fatal or has been treated by a cutting operation. In other instances the patient has been lost sight of after the operation. Of course this apparent lack of success may be a mere accident, but I am inclined to think that it is not so. The tissues of which the ear is composed are, for the most part, of such a kind that they do not yield readily to the action of caustics, unless to the strongest caustics very thoroughly applied. If it is determined to employ them, I should recommend chloride of zinc or Vienna paste, the latter freshly prepared. The powder must be made into a thick paste by the addition of a small quantity of water. The portion of the ear to be destroyed must be carefully mapped out, dried thoroughly, and then covered thickly with the paste. During the application, which must be from ten to fifteen minutes, the ear must be carefully watched, and means must be taken to prevent the caustic running beyond its assigned limits. The bloody serum which soon begins to ooze here and there from the surface must be taken up with blotting-paper or tiny pledgets of lint or cotton-wool. At the expiration of ten or fifteen minutes, the paste must be very gently wiped off with cotton-wool or a soft brush, and a poultice applied. If the eschar, which separates in the course of a week or ten days, comprises not only the disease, but a sufficient area of the surrounding and subjacent tissues, the wound may be treated with some simple application until it has completely healed. But if at any time there is the slightest doubt whether the destruction has been sufficiently wide, the caustic must be re-applied.

It need scarcely be said that the application is always painful, and sometimes severely painful. Immediately before it, the patient may be injected with a small quantity of morphia, unless there is a special indication to the contrary; or a dose of opium may be given internally. Or chloroform may be administered, not to the extent of producing muscular relaxation, but as it is employed during parturition.

The greatest care must be given to absolute cleanliness in cases in which caustic has been employed, just as ought always to be given in cases of operation with a cutting instrument. For the use of caustics affords no guarantee against erysipelas, to which an aged and debilitated person, the very person on whom the destruction by caustics is for some reasons desirable, may fall a victim.

Results of Treatment.—With a great deal of difficulty I have collected thirty-three cases of malignant disease of the external ear, in every one of which the disease was treated with a view to effect its cure. Unfortunately, nearly half the patients were lost sight of after the operation, but the reports of those who were kept under observation furnish valuable evidence of the success of operative treatment in certain cases.

Mortality due to the Operation.—Two of the thirty-three patients died of the results of the operation, one of them, a very old man between ninety and a hundred years of age, of erysipelas, the other of pyæmia. The removal was, in the former, of the diseased part of the ear (the lobule); in the latter, of the whole of the external ear; and, in both, it was effected with the knife. If this mortality were maintained in 100 cases, it would amount to 6 per cent., which must be admitted to be large for so trivial an operation—much larger than it ought to be. It is significant that the only deaths which took place were due to blood-poisoning, erysipelas, and pyæmia. I feel sure that this may, in part at least, be attributed to the fact that the removal of a part or the whole of the ear is regarded as a very minor operation, and that fewer precautions are on that account taken against wound-complications than are usual when the operation is more serious. I have already pointed out the means which should be taken to avert such calamities as these, and the danger which is to be apprehended from the harbouring of septic materials in the hollows and fissures of the ear and in the external meatus.

Very few of the operations were of greater magnitude than the removal of the whole of the projecting portion of the ear. In two or three of them, some of the surrounding tissues were also cut away, and, in one instance only, the glands below and behind the angle of the jaw were also dissected out. This patient made a good recovery, but was not seen after recovery from the operation.

Cures due to Operation.—The results of the thirty-three cases were as follow :—Two patients died of the effects of the treatment. Seven were dead or dying of recurrence at the date of the last report. Three had died of other causes. Fifteen were lost sight of after they left the hands of the surgeon. And six were alive and well at the time of the last report.

The period which had elapsed in these six cases was ten months, two years, two years, ten years, "many" years, and "many" years. Three of the patients were therefore alive and well at the end of more than three years after the last operation. To these three another must be added—a patient, namely, who died of old age three and a half years after the removal of the diseased portion of his ear. He had never suffered from recurrence, and the scar and lymphatic region were quite sound at the time of his death. Of the eighteen patients, therefore, who were kept for some time under observation, four were alive and free from recurrence for more than three years after the operation, two were sound more than two years after the removal of the disease, and two or three more were well at the end of nearly a year. The percentage of complete cures, if we may venture to deduce it from so small a number of cases, is 22·22. This is certainly a large percentage, but yet I think not so large as it ought to be when all the circumstances of the cases are taken into consideration. The disease is, in most cases, so situated that it can be removed much more freely than malignant disease of many other parts of the body, where nevertheless a good percentage of complete cures has been obtained. It is often of very limited extent, and yet has existed for several or many years. The duration of disease, the slow progress made in the course of five, six, or eight years, and the absence of affection of the lymphatic glands in some of the cases, make it almost certain that (in spite of the absence of proof by microscopical examination) the disease was that least malignant of all malignant diseases, "rodent ulcer." The common variety of epithelioma of the ear, although not very malignant, does nevertheless occasionally run its course with great rapidity. Among the cured cases there are, I am glad to say, one or two of this variety, perhaps more. I made the examination of the disease in one instance myself—that of the old man who died of old age three and a half years after the operation. The ulcer, both to the naked eye and to the microscope, bore all the characters of typical epithelioma. The patient was a schoolmaster, seventy-four years old, in whom the occipital aspect of the helix and concha were the seat of epithelial ulceration of six months' duration. The operation was limited to the free removal of the diseased parts of the ear, and did not comprise the whole of the pinna.

In all the cured cases the operation was performed with the knife. In not one of them was there affection of the lymphatic glands; in not one of them was there an operation for recurrent disease. A single operation sufficed for the cure in every instance. In one of the partially successful cases, however—a case which may prove to be quite successful, for the patient was well two years after the last operation—the disease (which was regarded as a rodent ulcer) was treated several times by chloride of zinc and other caustics between the years 1852 and 1857. It again recurred in 1858, and was freely removed with the knife in the course of that year.

The loss of a part or the whole of the external ear is certainly a disfigurement, but may be concealed to a great extent by management of the hair. The loss of hearing which depends upon it is not very important to those persons whose hearing in the other ear is good, and in whom the internal and middle ear of the affected side are sound. In other persons it may be needful to supplement the natural hearing by means of an artificial ear.

Conclusions.—The removal of malignant disease of the external ear should be undertaken in all cases in which there appears a reasonable prospect of complete removal of the disease.

The operation with the knife has hitherto been by far the most successful so far as complete cure of the patient is concerned.

Removal with the knife has also proved to be the most dangerous method of treatment, probably because the trivial nature of the operation has led surgeons to neglect precautions which ought to have been taken against wound-poisoning.

The removal of the disease should be so free that a wide margin of the apparently healthy tissues is taken away together with the disease, but it need not necessarily include the removal of the entire ear.

CHAPTER IX.

FACE.

I SHALL not attempt to deal with the growths which occasionally affect the deeper structures of the face, but shall limit this chapter to the consideration of the malignant affections of the integument. The external ear and the lower lip are treated in separate chapters.

The parts of the face which are most frequently attacked are those which lie above the line of the mouth, particularly the region of the nose and eyelids. And the variety of malignant disease which is by far the most frequently observed is that peculiar modification of squamous-celled carcinoma (epithelioma) to which the name of "rodent ulcer" has been applied in this country and the United States. The common variety of epithelioma, such as occurs on the organs of generation and various parts of the surface of the body, also attacks this region of the skin of the face, but much less frequently. Other varieties of malignant disease are just as rare as the two varieties of epithelioma are common.

I do not know what there is in the integument of the face to render it so peculiarly prone to cancer. Probably exposure has some part in the preparation of the tissues for the disease. And, as in the case of squamous-celled carcinoma of other parts, age plays an important part. But beyond this it is difficult to perceive what conditions decide the epithelial structures here so much more than elsewhere to undergo the cancerous transformation. Both sexes are so nearly equally liable to it that, of 210 cases which I have collected from various sources, 120 were of male patients, ninety of female. I fully expected to have found a much greater difference than this, and also that a large proportion of the patients were employed out of doors in occupations which subjected them to continual exposure to the weather. But, although a large number of the 210 were hospital cases, many of the patients were of a much higher social grade, and many of the women followed only indoor pursuits, so that they may be said to have been almost entirely protected. The disease is very rare in persons under thirty-five years old. It becomes much more common after fifty years of age. It commences in the form of a small wart or rough, heaped-up plaque, or tiny crack or sore. If this were let alone, it is not improbable that it would never develop, in a certain number of individuals, into cancer. Or better still, if it were completely destroyed or cut away while yet of small size and insignificant. But it is examined at very frequent intervals by the patient, is teased, and picked, and pulled, and made to bleed, until at length it acquires a greater extent, a slightly raised border, and a slightly, if ever so slightly, indurated base. If it has not been previously ulcerated, it now breaks down, and, for the remainder of its existence, is distinguished as an ulcer, not a tumour. But the sinuous margin of the ulcer is almost invariably characterized by its slightly raised and hard border, which may constitute the sole sign by which its relationship to a new growth is marked. The malignant ulcer is at first really trivial in extent and probably in importance; for it is superficial, and so easily removable that a snip with a pair of scissors might completely rid the patient of it in this early stage of its existence. And its progress is so slow that in the course of months or even of years it may appear almost stationary. Yet it slowly and, in most persons, continuously enlarges and deepens, destroying the true skin, the subcutaneous tissue, the muscles, fasciæ, periosteum, until it reaches the bone itself. Nor is its progress here arrested, although it may be for the time retarded. The bones of the nose, the orbit, and the cheek are slowly destroyed, and the disease may make its way into the cavities at the base of the skull and into the interior of the skull, and so reach the membranes of the brain. From the margins of the orbit it may reach to and destroy the eye, and spread across the bridge of the nose to the opposite orbit. From the orbit it may creep down the lachrymal canal to the interior of the nose, or, more boldly and openly, may break down the bony and cartilaginous barriers, and so enter the nasal cavities. Every surgeon is familiar with the awful ravages of the advanced disease, the vast chasm which is formed in the very centre of the face, the destruction of the nose and of one or both eyes in the worst cases; and every surgeon admits the impotence of surgery against these conditions.

On account of certain points of difference between these rodent ulcers and the cancers of almost all other parts of the body, the cancerous nature of the disease was for a long time denied. The credit of having maintained the true nature of the disease is due to Charles Moore (*Rodent Cancer*, 1867), to Collins Warren (*The Anatomy and Development of Rodent Ulcers*, 1872), and to Thiersch (*Der Epithelialkrebs*, 1865). At the present time it is so generally admitted, that almost the only question which is still disputed is the exact layer of epithelium from which the cancer originates.

The malignancy of these rodent cancers of the skin of the face is clinically shown by the manner in which they slowly spread, and involve and destroy every structure with which they come in contact, and by the tenacity with which they cling to the patient, and the impossibility of dislodging them, if they are permitted to attain a large size and to affect the deep structures. But it is remarkable that they scarcely ever affect the lymphatic glands, and that they are practically never associated with similar disease in distant organs and tissues.

Cancer of the face (whether rodent cancer or the more common epithelioma) is essentially a local affection, at first of limited extent and very limited thickness, and only slowly growing in breadth and depth, but capable of producing the most profound local effects. Unlike the cancers of many other parts of the body, it remains local to the very end, killing only by its local influence, pain, profuse discharge, meningitis, and encephalitis, or predisposing to death from intercurrent diseases. It may exist for twenty or thirty years without producing death, provided its course is very slow and does not involve a vital part.

Curiously enough, these cancers of the face sometimes exhibit a peculiarity which is scarcely ever noticed in the cancers of other superficial parts. They skin over and heal. But I cannot say that they are ever completely healed in this way. For the new skin only covers a small part of the sore in most instances, and the disease continues to extend at one border while it heals at another. Beneath the new skin, too, I have convinced myself that the essential structure of the cancerous disease may continue to exist and flourish; so there need be no wonder that the cicatrix by-and-by breaks down and ulcerates again as if it had never healed.

Although cancer of the face is usually single, like the cancers of other parts of the body, there are numerous instances on record of multiple cancers, or of the occurrence of a second cancer at a distance from the first, either after the first ulcer has been removed or while it still remains untreated.

Methods of Operation.—The disease may be removed by means of scraping instruments, with the knife, or by caustics; or a combination of any two, or of all three, methods may be employed.

Scraping is very seldom employed unless for cancers of small extent and very superficial. Volkmann's sharp spoon is an instrument well suited for the purpose. The scraping, if it be selected for any special reason, must be carried deeply through the disease, and clear it thoroughly away down to and into the healthy tissues. I do not think it is a suitable method, used alone, of treating so formidable a disease as rodent ulcer undoubtedly becomes if it is not thoroughly dealt with in its early stages, for it does not ensure the removal of a sufficient area of the surrounding tissues. But it is often a very useful adjunct to the removal with the knife, or may be used to clear away the bulk of the disease before the application of a caustic.

Removal with the Knife.—The differences in the situation, extent, depth, and relations of the various examples of cancerous ulcer of the face are so great that no definite rules can be laid down with regard to the exact operation which is desirable in an individual instance of the disease. There are, however, certain general rules which should be observed in every case, and I shall draw attention to them the more urgently because they have been too generally neglected. In the first place, it is of the utmost importance that the skin around the disease should be thoroughly cleansed before the performance of the operation. The same care which is bestowed on the skin of the breast, the abdomen, and other parts before an operation should not be grudged to the skin of the face. Indeed, there is greater reason for care, on account of the wrinkles which many of the patients exhibit, and the dirt of various kinds which lodges in them. When the deaths following operations come to be considered, the necessity of this and similar cares will be seen. Erysipelas, pyæmia, meningitis, and gangrene make up nearly the whole of the causes of death, and I feel sure that one of the chief reasons for this is the want of care which is too often exhibited in preparing the patients for operation, and to the absence of sufficient, rather than to the want of proper, antiseptic dressings after it has been performed. In the second place, the line of incision must be carried far outside and beneath the disease, so as to remove a wide area of the surrounding apparently healthy tissues. No respect should be paid to the disfigurement which may follow free removal of the disease. The one fact to be borne in mind is, that if it recurs it will produce infinitely more disfigurement than even the widest operation for its removal, and that the difficulty of dealing with recurrent cancer is far greater and far less likely to be followed by permanent success than when the primary disease is treated. When the disease is of small extent and in an early period of its existence, the operator may the more cheerfully proceed to make a very free removal of it, on account of the far greater probability of completely ridding the patient of a loathsome and often painful malady. I have never yet seen reason to regret a too free removal of a cancer of the face, but I have seen reason, both for myself and others, to deeply regret that a wider removal had not been accomplished when first the disease was dealt with by operation.

With regard to the best method of preparing the integument for operation, it should be thoroughly washed two or three times with soap and water and covered for at least twenty-four hours previous to the operation with lint soaked in (1 in 40) carbolic lotion or some equally powerful antiseptic liquid. If the area round the ulcer is very sensitive, and the rubbing of thorough washing cannot be borne, it may be cleansed by poulticing with linseed meal and charcoal, and then by the application of an antiseptic solution. The very large ulcers which sometimes extend into the nasal cavities or eat deeply into the orbits are very difficult to cleanse, and are consequently on that account alone more dangerous to deal with.

Caustics.—Caustics have been very largely employed in the treatment of the earlier stages of rodent ulcer—more largely, probably, than any other means. But they have been employed in such a half-hearted fashion, and apparently with so little confidence on the part of the operator of really ridding the patient of the disease, that they have almost come to be regarded by the profession as an absolutely useless means of cure. There is not the slightest reason, however, why even extensive rodent cancers should not be treated by means of caustics with as thorough success as if the knife had been employed. Faint-hearted applications of nitric acid, the acid nitrate of mercury, Vienna paste, and chloride of lime, which are so used that they only destroy the surface of the disease and leave the base behind, do more harm than good.

It is of little consequence which of several caustics is selected, caustic potash, Vienna paste, or another, provided the main object of the applications is kept in view—not merely the destruction of the disease, but its prompt and complete destruction. I have not myself used Bougard's paste for the cure of a cancerous ulcer of the face, although I have used it very successfully for the treatment of cancer of the breast. A full account of its composition and of the method of employing it is given in the chapter on the Breast, and I need only mention here the recommendations of Dr. Bougard for the management of it on the face. He says that the epidermis of the indurated borders of the ulcer must be destroyed by means of Vienna paste, applied for about eight or ten minutes. The Vienna paste is then carefully removed, and the special paste is applied over the whole surface of the sore, covered with charpie, and kept in place by a bandage. It is kept on for five or six hours, and then replaced by a poultice. On the following day, a part of the eschar is cut away and a new layer of his paste is applied if it is necessary.

Usually a single cauterization suffices; but in other cases two, three, or four are needed. In all cases the treatment must not be suspended until the ulcer is completely destroyed, as well as its roots or prolongations, if there are any ("ainsi que les racines ou les prolongements, s'il y en a"). When the disease has been entirely cauterized, poultices are applied until the eschar has separated. It is then necessary to examine with the most minute attention for any doubtful place, which must be cauterized to the bottom. If there are no doubtful places, the edges of the wound are brought together by means of straps fastened with collodion (*Études sur le Cancer*, par Dr. Bougard, Bruxelles, 1882, p. 754).

The circumstance that the subjacent bone is affected by the disease need not prove an obstacle to the use of caustics, which destroy the bone readily.

Results of Operations.—*Mortality due to the Operations.*—I have collected from several different sources 206 cases of cancer of the face, in the large majority of which the disease was what is termed "rodent ulcer." Most of them are taken from Mr. Hutchinson's report in the *Medical Times and Gazette* of 1860, from Fischer's papers, von Winiwarter's and Volkmann's *Beiträge*, and Thiersch's *Epithelialkrebs*. The total number of deaths which were attributable to operation in the 206 cases was twenty-one—as nearly as possible 10 per cent. The percentage is larger than I had expected, yet perhaps not larger than might have been expected when the very extensive character of many of the operations is taken into account, the advanced age of many of the patients, and the small care which has been taken in past years to render the tissues thoroughly clean before the performance of the operation. The causes of death were pyæmia, two; erysipelas, nine; meningitis, five; collapse, marasmus, lung œdema, delirium tremens, and gangrene (one each) five. The meningitis was due in most, if not in all, the cases to interference with the membranes of the brain, probably in removing the disease from the orbit or the interior of the nasal cavities. There are no materials from which a comparison between the relative danger of different methods of treating the disease can be drawn up, so far as I am aware. Certainly they are not to be found in the works from which these cases have been drawn. But one fact comes very clearly out, namely, that all the deaths save one followed extirpation or excision with cutting instruments. Only one of them followed destruction with caustics, and in that case the ulcer had been scraped away before the caustics were applied. The number of cases in which the treatment was conducted by means of caustics alone was very small; but the number of cases in which caustics had been applied, in some instances repeatedly, before the cancer was excised, was very large. Bougard does not admit having lost one of his patients of the results of the caustic treatment, but I do not know the total number of cases of cancer of the face on which he had operated. Speaking of "cancroid" generally, he says that, between the years 1867 and 1878 inclusive, he treated fifty-eight cases of cancroid, but the disease was of other parts of the body as well as of the face.

Of course I do not know what selection Dr. Bougard made of his cases for operation, but, judging from the account which he gives of the cases of cancer of the breast which are suitable for operation, he is much more cautious in undertaking advanced cases than are the majority of hospital surgeons. That the method by caustics is not without peril of life, I am sure. For within the last few months the history of the death of a feeble man from caustics applied to a cancer of the face has come to my knowledge. If Dr. Bougard has in truth been so fortunate as his work appears to show, I can only congratulate him. And at the same time I have no hesitation in deploring what I cannot but regard as a very large mortality due to cutting operations. With greater care in future I hope this may be avoided, and that the mortality may be diminished to what may be considered a reasonable percentage.

Cures due to Operation.—Under this heading I have very satisfactory information to impart, yet not so satisfactory as I hope may fall to the lot of some future author. For I am quite sure that a better knowledge of the characters and course of cancer of the face, especially of its characters in its earliest stages, will lead to more thorough and appropriate treatment when it is still of small extent, and when it is really almost absolutely under the control of surgery.

Of the 206 patients who were subjected to various methods of treatment, twenty-one died of the effects of the treatment, thirty-six of recurrence of the disease, fifteen were alive with recurrence, most of them beyond the reach of a reasonable attempt at cure, fifty-nine had been lost sight of, and seventy-five were alive and well at various periods after the performance of the last operation. Of these seventy-five, fifty had passed the three-years' limit, and may consequently be regarded as "cured." The remaining twenty-five had only lived free from disease from one to three years after the last operation—none of them under a year, however. They may be classed as relieved, but not yet as cured.

Of 147 patients, then, whose history is known to us, fifty were cured by operation and twenty-five were relieved so far that good hopes may be entertained of the complete cure of several, if not of many, of them. The lower lip alone, of all the parts of the body of which this book treats, offers better results, for the percentage of complete cures is rather larger, and the percentage of deaths is very decidedly smaller.

It is of the highest importance to study the cases in which treatment was successful. In the first place, with scarcely any exception, the treatment which succeeded was excision with cutting instruments, in a few instances aided by the application of caustics. In many of the cases caustics had been employed before the disease was cut away; but to this I attribute very little importance, on account of the imperfect manner in which the caustics were used. The situation of the cancers varied largely. Some of them were limited to the cheek or forehead, but this was by no means universally the case, for many of them implicated the eyelids and nose, and some of them had eaten away a large part of the nose and entered the nasal cavities. But such cases as these were notable exceptions to the general rule. It is particularly noted in many of the successful cases that the disease was of very small extent, in some of them not exceeding the diameter of a pea or a single centimètre, in many of them about the size of a bean, a bullet, or a nut. Again, and this is a fact of equal importance, in all save two of the fifty most successful cases a single operation sufficed for the cure of the disease. Of course, there was no question of the removal of associated, or later removal of enlarged, glands, for there were not any which were affected by the cancer in any of these cases. Indeed, I only find an account of real secondary affection of the glands in one instance, and there are two or three more of the 210 cases mentioned in the earlier part of this chapter in which the glands were enlarged, but the imperfect later history of the cases leaves it doubtful whether they were cancerous or not. There are, on the other hand, several instances recorded in which enlarged glands were associated with cancer of the face, but after the removal of the primary disease the glands subsided, and the patients were completely cured of their disease. The duration of the disease in the successful cases was from a few months to several years before the performance of the operation. But in most of the cases in which the duration was years instead of months, the disease was nevertheless of small extent, and therefore of more moderate malignancy than usual.

Of the relative value of caustics when they have been applied with a decided intention of curing the disease, I have no information which applies only to the face. Bougard, in speaking of the results of treatment in the fifty-eight cases of "cancroid" to which reference has been already made, says that, of this number, he counts forty-four definite cures, twelve deaths from recurrence, and two lost sight of. By definite cures he means that the patients were alive and free from disease at least three years after the destruction of the disease. But, as I have before said, these cancroids were of other parts of the body as well as of the face. And there appear to have been among his cases of cancers of the face some other malignant diseases than the cancroids. Thus, I find notes of cases of "cancer" of the cheek and "encephaloid" of the cheek which I do not think are included in his list of cancroids.

Are patients who are not cured, benefited by operation? The answer may be given decidedly in the affirmative, provided the disease is removed so thoroughly that there is a long interval of freedom from recurrence. It is not merely that the advantage is obtained of ridding the patient for a more or less considerable period of a foul ulcer and replacing it with a scar. But an operation, if only for a few months successful, will sometimes relieve a patient of considerable pain. Two patients on whom I have operated from time to time without any real hope of curing them of the vast cancerous ulcers from which they have suffered have, after each operation, experienced marvellous relief from pain, even during the healing of the large wound made by the removal of the cancer. Of course there is no question here, as there is in the surgical treatment of the cancerous affections of many other parts of the body, of what may be termed "shifting the position of the disease"—removing, for example, an ulcerating or very painful primary tumour with the hope of preventing local recurrence, yet with the full recognition that the patient will shortly die of the disease in the neighbouring glands or in some remote organ. In the treatment of cancer of the face, recurrence *in sitû* is the only problem with which we have to deal. If this can be prevented, the patient is cured. If it cannot be prevented, the relief which is afforded by an operation may be measured by the interval of freedom from recurrence and by the arrest of the steady progress of the cancer. In a large number of instances these advantages alone are worth the danger which the patient runs from an operation. The thoroughly disappointing cases are those in which the disease is of a peculiarly and unexpectedly malignant type, and in which recurrence is immediate, the recurrent disease appearing to have been rendered more active by interference. Such cases are, fortunately, very unusual.

Conclusions.—If cancer of the face is treated by free removal or destruction when it is of small extent, the prognosis is good.

In cases in which the disease is of considerable extent, and particularly in which it has invaded the cavities behind the face, the prognosis of treatment is bad.

The prognosis of the treatment of recurrent disease, unless the recurrent cancer is of very small extent and slow progress, and is well situated for operation, is bad.

The sole object of treatment must be to prevent the local recurrence of the disease.

This object may be attained either by cutting instruments or by caustics. It is difficult to judge which method is likely to afford the best results, whether their relative danger is considered or their remote results.

In all probability, judging from the results of the treatment in some other parts of the body, the treatment by caustics is less dangerous to life than that by cutting instruments, and may therefore appropriately be employed in the cases of old and feeble persons.

The treatment by cutting instruments may almost certainly be rendered less dangerous to life by greater care in the preparation of the patients, and perhaps in the after-treatment of some of them.

It is almost certain that the imperfect application of caustics does harm by irritating the disease and exciting it to increased growth.

The fear of disfiguring a patient by free removal or destruction of a cancer of the face must not be allowed to interfere with its thorough removal. It must always be borne in mind that the disease, if allowed to pursue its course, will produce a hundred-fold greater disfigurement and distress than a thorough operation.

From a quarter to half an inch of the surrounding healthy looking tissues should be removed or destroyed.

In no cases of cancer are early and free operations likely to be attended by such good results as in the case of primary cancer of the face.

CHAPTER X.

LOWER LIP.

THE lower lip is very rarely the seat of any other form of malignant disease than epithelioma (squamous-celled carcinoma). Men are so much more frequently attacked by the disease than women that epithelioma of the lower lip is regarded as essentially a disease of males. It is seldom observed in persons under forty years of age, and becomes comparatively more frequent during each decennial period of life. The prolabium is the part on which the cancer first appears, sometimes as a wart, sometimes as a scab, sometimes as a fissure or ulcer or crack. Either of these conditions may remain, with very little change, for many months or even years, and each of them may be regarded rather as a pre-cancerous stage than as an actual cancerous condition. The wart is picked off, and forms again; the ulcer or fissure is cauterized, and deepens. In the course of time induration forms around the base of the pre-cancerous condition, and may extend until it is out of all proportion to the wart or scab or sore. The latter, too, may spread along the prolabium, either laterally or in front towards the skin, and backwards towards the interior of the mouth. Of the two, it is more prone to spread along the margin of the lip, and may reach the corner of the mouth. After a variable period, extending in some instances over many years, the lymphatic glands become affected—those in the floor of the mouth and in the sub-lingual and sub-maxillary regions. The affection of the glands usually takes place slowly, and they are sometimes enlarged long before they are actually cancerous, for, in some instances in which the primary disease has been removed and the enlarged glands associated with it have been left behind, they have subsided and the patient has made a complete recovery. From the glands first affected the disease may reach those of the neck, and may gradually extend until all the lymphatic glands between the jaw and clavicle are cancerous. The primary affection also progresses until the whole of the lower lip may be diseased down to the chin, the gum and lower jaw may be invaded, the corner of the mouth destroyed, and terrible disfigurement of the patient's face ensues. The rate of progress of epithelioma of the lower lip is very variable, so much so that there are cases on record in which the disease has been present ten or fifteen years before it has been subjected to operation, and even then the glands have not been affected; while there are other cases, of which I have myself seen more than one, in which the cancer runs so rapid a course that the patient has died, within a few months of its first appearance, with very extensive ulceration of the lip and secondary affection of a large number of the glands.

The manner in which it produces death is usually byexhaustion, from ulceration of the primary cancer and breaking down of the lymphatic glands, with the production of vast sloughing cavities in the floor of the mouth and in the neck. Even in those cases in which the disease has existed for several years, and the patient dies at length worn out by it, there is seldom any affection of other tissues or organs at a distance from the primary disease. Occasionally deposits are found in the lungs, the liver, or other parts; but this is a very rare circumstance.

Methods of Operation.—Only two methods are practically employed at the present time for the eradication of cancer of the lower lip—removal by the knife or scissors or galvano-cautery, and the application of caustics. For, although one hears occasionally of Thiersch's method of injection of the growth with acetic acid or some similar proceeding, the instances in which these have been employed are so few that it is scarcely worth while to take them into account in considering the methods and results of treatment, particularly as they do not appear to offer any advantage over the two chief methods of which mention has been made.

Removal by the Knife, Scissors, or Galvano-cautery is much more frequently performed than destruction by the application of caustics, at least by qualified medical practitioners—first, because it is far more easy to regulate the amount of damage done; second, because the treatment is far less painful. Of the three instruments the knife is almost universally employed, and all ordinary forms of the disease are removed by one or the other of two incisions. Small indurations, not extending far along the margin of the lip, compact and not adherent to the parts behind the lip, are usually removed by a V-shaped incision, which includes the whole of the little tumour and a free margin of apparently healthy tissue on either side of it. The bleeding is stanched, and the two sides of the incision are brought together with hare-lip pins or wire or other sutures. The wound usually heals by the first intention, the continuity of the prolabium is preserved, and, provided too large a slice has not been cut out, there is no sensible, or at least distressing, deformity of the mouth.

The second incision is crescentic, and is better adapted to those cases in which the disease has spread along the prolabium until an inch or more of it is involved. To take this out by a V-shaped incision would be to sacrifice too much of the margin of the lip, and to leave the patient in a distressing condition in consequence. The growth is therefore removed by a curved incision passing from one side round beneath it to the other side, taking care to include a free margin of the healthy structures. After the hæmorrhage has been stayed, the cut edges of the skin and mucous membrane are brought together by means of several horse-hair or soft silver-wire sutures all along the length of the wound, so that there remains little or no open wound, and both the healing and final result are better than when the wound is left open and treated with some simple dressing.

It has been recommended that a microscopical examination shall be made of the diseased parts as soon as they have been removed, to discover whether there are any centres of cancer beyond the visible and tangible induration reaching quite up to the cut margin. But the impossibility of carrying out this scheme thoroughly, and the difficulty of distinguishing cancer centres from masses of cells of some quite harmless kind, have prevented any one from seriously attempting it. The surgeon, therefore, is content to be guided by the gross characters of the disease, and believes that the operation has been sufficiently carried out if he takes away at least a quarter of an inch of the tissues which appear to be healthy around the growth.

The two incisions which have been described require modification in those cases in which the disease is very extensive, or in which it affects the corner of the mouth or grows through the lip into the gum or jaw. It is necessary then to depart from what may be regarded as the routine course, and to make such incisions as may be needed for the complete removal of the disease without regard to the disfigurement which results. The infiltrated bone may be scraped and cauterized, or may be resected.

The disfigurement which necessarily results from operations such as these may be greatly lessened by plastic operations, but it is not within the province of this work to describe the operations which have been practised with advantage.

Enlarged glands beneath the jaw and in the floor of the mouth should be taken away as soon as they are discovered, provided they are not firmly fixed and therefore probably not removable. This rule of removing enlarged glands holds good for those cases in which the enlargement of the glands is not actually cancerous, for it is not usually possible to distinguish the characters of the non-cancerous from the cancerous enlargements, although the hardness of the affected glands is of importance in forming a correct opinion.

Scissors are employed by those surgeons, few in number, who prefer them to the knife. And the galvano-cautery is used in those cases in which it is exceedingly important that there shall not be even what would in other cases be considered as a trivial loss of blood.

Caustics are employed occasionally by surgeons, and much more often by non-professional cancer-curers. It is not at all difficult to remove a cancer of the lip with caustic if the disease is limited in extent and neither deep nor adherent to the subjacent structures. Various caustics are used for the purpose, but none is better or more effectual than Vienna paste or chloride of zinc. No special preparation of the part is needed, nor is it necessary to destroy the superficial layers with any other variety of caustic. The surrounding prolabium is protected by a piece of thick plaster, from the centre of which an area is cut out of the size of the cancer and a little more. A paste composed of the chloride of zinc alone, or made up with a certain proportion of flour and water, is applied over the disease. A single application may suffice if the tumour is of very superficial depth. If it is deeper, the layer destroyed by the first application is scored through with a knife, and tiny strips of thin rag covered with the caustic are inserted into the scores. In the course of a few days, the time varying according to the size of the tumour and the toughness of the tissues, the dead mass falls off and a healthy wound is left behind. The use of caustics of whatever kind is usually attended with much more pain than is experienced after the removal of the disease with the knife. Although nothing appears more simple than to remove a small epithelioma of the lip by means of caustic, there is nevertheless room for error, and it has been justly remarked that operations of this kind are often far better performed by the commonest cancer-quacks than by professional men, because the quacks are constantly in the habit of using caustics, and continual practice has taught them how much and in what manner to apply the substance in each special case. (See the chapter on the Breast.)

Results of Operations.—*Mortality of the Operation.*—The dangers due to the operation depend so much on its extent that it is very difficult to give any definite idea of the average risk to life. There can be no doubt that the mere removal of a small cancer of the lip, whether it is removed by a wedge-shaped or a crescentic incision, carries with it very little danger, even when it is performed on very old men whose health is not robust for their age. But the case is very different when the operation consists in cutting away a large part of the lower lip, the removal of glands beneath the jaw, the excision of a portion of the lower jaw, and a plastic operation for the relief of the disfigurement due to the operation. Taking, however, a very large number of operations of different authors, the 896 operations, for example, collected by Wörner (*Beiträge zur klinischen Chirurgie*, von Paul Bruns, ii. 129, 1886), we find that they contain only sixty-two deaths—a proportion of about seven to the hundred. This must be admitted to be a small mortality when the very extensive nature of many of the operations is taken into account, and the age of many of the patients. Even this mortality is probably larger than it would be if the same operations were performed on the same patients at the present time, for most of the largest percentages of mortality occurred many years ago, before the present methods of dressing wounds and managing patients after operation were practised. Thiersch, for instance, numbered seven deaths in the forty-eight cases of operation which he published in his work on epithelial cancer in 1865, and Billroth recorded four deaths in the thirty cases on which he operated during the period of his surgeoncy at Zürich. The probability of improvement is clearly shown by the publication of Billroth's later statistics by von Winiwarter (*Beiträge zur Statistik der Carcinome*), for at Vienna he operated sixty-two times with only three deaths. Had the proportion of deaths of his first period at Zürich been maintained, there ought to have been eight instead of three deaths in the sixty-two operations. The employment of iodoform as a dressing for the more extensive wounds has been thought by some, and I believe correctly, to have contributed to the diminution of the mortality. Many of the deaths in the tables to which I have referred were due to pneumonia (probably septic), erysipelas, pyæmia; and there can be little question that the prevention of putrefaction of the discharges proceeding from the wound will greatly tend to diminish such causes of death. But, in addition, I think enough has not been done in the direction of cleansing and preparing the parts before the operation, and of feeding the oldest and feeblest patients after the more extensive operations. The improved results which have followed the introduction of regular feeding by means of a tube are alluded to in the chapters on the Tongue and Jaw, and there is good reason why similar feeding should be employed in cases of extensive operations on the lips. Not only would the number of those who die of exhaustion be lessened, but patients fed in this manner would be less liable to septic poisoning.

Cure of the Disease.—Fortunately, on this question there is a large and very valuable mass of information. It is chiefly derived from German sources, from the statistics of von Winiwarter, Thiersch, Fischer, Koch (*Deutsche Zeitschrift für Chirurgie*, xiv. and xv.), Bergmann (Dorpat), and Wörner. Wörner has analysed not only the cases which have been treated for many years past in the clinic of von Bruns, but has in part analysed those which he has taken from the other authors whose names have just been mentioned. The total number of cases is 866, but the whole number is not available for the purpose of this chapter, on account of the fact that Wörner has not subtracted those cases in which the further history of the patients was not traced. Owing to this circumstance, there is a wide difference between the proportion of successful cases in the clinic of von Bruns and the proportion of successes on the total number of 866. For example, of the 277 patients who were treated in von Bruns' clinic, 106 were known to have passed the three-years' limit, and were either still alive and well or had died of some other disease than cancer, so that the percentage of successful cases is a fraction over 38. But on the whole 866 patients treated in various clinics the percentage of successes is only just over 28. The difference is so large that I was at first puzzled to account for it; for there did not appear to be any essential difference either in the manner of performing the operation in the different clinics or in the amount of healthy tissues which were removed in the immediate vicinity of the disease. Indeed, Thiersch, who had perhaps more thoroughly than any other surgeon recognized the immense importance of very free removal, had the smallest percentage of successes to exhibit. But when I came to examine the collections of cases from which these numbers were drawn up, I found that the history of all the 277 patients treated in the Bruns clinic had been followed up to date, whereas a large proportion of the patients in other clinics had been lost sight of. I therefore made a new calculation on a total of 424 patients whose disease was treated in different clinics, and who had been kept in view up to the time of publication of the report, or who were known to have died of one cause or another. Of these 424 persons, no fewer than 160 had happily passed the three-years' limit, so that the percentage of successes is a fraction over 38, precisely the same as the percentage in the Bruns clinic.

It is very pleasant to contemplate so large a measure of success. We have certainly long been familiar with the impression that cancer of the lower lip is a disease which is really treated with success, but such proofs have never been previously laid before us.

Even these numbers do not, however, display nearly the whole of the good which has been accomplished by the removal of cancer of the lip. To say nothing of the very long period which had elapsed in some of the cases since the date of the operation, amounting, in a goodly proportion of them, to ten and twelve years, and in a few instances to twenty or thirty years, there are a large number of instances in which patients had been so far successfully treated that they were well at the end of from one to three years after the operation, but time had not permitted them to reach the limit of three years, which we regard as essential to complete success. In the Bruns clinic alone there were fifty-four persons who had been operated on, at various periods from a few months to three years, before the period at which the results were estimated. They can only be classed, so far, as relieved, not cured.

With regard to the character of the disease in the successful cases, there is no doubt that it was, in a very large number of them, of small extent, not quickly growing, not associated with affection of the lymphatic glands, and that a single operation sufficed to rid the patient of it completely. In the treatment of cancer of the lower lip, as in the treatment of the cancers of many other parts of the body, the returns show that the operations were, in many instances, deferred until the little tumour had existed for from one to several years, yet that some of these deferred cases were the most successful. The tumour had grown very slowly, had not become adherent to the neighbouring structures, and had not produced secondary affection of the lymphatic glands. They were therefore growths of very modified malignancy.

Although the association of affection of the sub-maxillary or sub-mental glands undoubtedly largely diminishes the prospect of a complete cure by operation, there is nevertheless a much larger number of instances in which enlarged glands were successfully removed than I had expected to find. And Wörner mentions one instance in which even recurrent affection of the lymphatic glands was removed with complete success, for the patient remained well for thirteen years after the last operation.

In order to ensure against affection of the glands appearing after the removal of the cancer of the lip, Wörner says that von Bruns has been for some time past in the habit of removing the glands at the time of the removal of the primary disease, whether they can be felt to be enlarged or not. And Gussenbauer has, I believe, followed a similar course. It will be interesting to compare their later with their earlier statistics (before the introduction of these dissections), if they are published by-and-by. At present Wörner says that sufficient time has not elapsed to allow an opinion to be formed regarding the advantage of the practice. I have already alluded to this practice in the Introduction, and need only say here that I have never met with any sufficient proof that it is desirable. The slightest enlargement of the glands can be so well felt through the floor of the mouth with the fingers of one hand in the mouth and those of the other behind the jaw, and the difficulty of discovering and dissecting out glands which are not enlarged and are not obviously diseased is so great, that I have little faith in the preventive operation.

On the other hand, glands which are enlarged should not be left behind in the hope that they are not affected by cancer. They should certainly be removed, for they can usually be easily dissected out, and the wound in the floor of the mouth adds comparatively little to the danger of the operation.

Operations for recurrent disease of the affection of the lip are attended with a much smaller prospect of success than the original operations. And the prognosis becomes worse with each recurrence of the disease. Wörner points out how almost absolutely hopeless are those cases in which, with recurrence of the primary disease, there is associated enlargement of the lymphatic glands.

On one point I think a warning should be given. The very low degree of malignancy of many examples of cancer of the lower lip must not blind surgeons to the fact that individual instances may be met with of labial epithelioma which exhibit a malignancy of a very high order. One such case occurred in my own practice. There was a cancerous ulcer of the prolabium of a gentleman of fifty years of age, of small extent, and of several months' duration. As it occupied about an inch of the prolabium, and extended only a very little distance into the substance of the lip, I removed it by a crescentic incision, taking care to remove with it a very free margin of the adjacent apparently healthy tissues. In spite of this, recurrence took place within three months, and the recurrent disease spread rapidly into the substance of the lip, which it destroyed as rapidly by ulcerating. I declined to perform a second operation, partly because the disease had recurred so speedily, partly because the patient, a very nervous and not very healthy person, was just recovering from an apoplectic seizure. But the operation was performed elsewhere. Within two months of it the man was dead. The glands beneath his jaw, which at the time of the second operation had not been appreciably enlarged, speedily grew to an enormous size; all the cervical glands became similarly affected, and there were signs of affection of the liver and of other of the internal organs. When first this patient came under observation there were no signs by which the disease could have been judged to be more malignant than usual. Nor had I the least idea, even before the second operation, that there was any immediate danger that the patient would die of it, although I judged, from its speedy recurrence, that it was much more malignant than the great majority of cancers of the lower lip.

Are patients who are not cured, benefited by operation? To this question an answer may be given certainly in the affirmative for all those cases in which, by a very trivial operation, the patient is temporarily rid of a disease which will in time prove horribly disfiguring and offensive, and may be very painful. When the tumour recurs *in situ*, and the recurrence is beyond the reach of a reasonable attempt to remove it, no relief is afforded beyond the time during which the patient has been free from recurrence. To be rid of the local disease, if only for a time, is a great boon, by no means too dearly purchased by an operation of small magnitude. The horrible destructive ulcers which usually are produced in the later stages of the disease are bad enough; but I have seen large epitheliomatous masses of the lower lip which are even worse than the ulcers.

In accordance with the plan which has been followed throughout in this book, I have said nothing of the reparative operations which may be successfully practised after the removal of labial cancers of considerable size. An account of such operations may be found in various works on general and operative surgery.

Conclusions.—The removal of cancer of the lower lip may be undertaken in all uncomplicated cases with a very good hope of permanent success.

The operation should be performed at the earliest possible period of the disease, when there is yet doubt whether the affection of the lip has actually become cancerous.

If the glands are enlarged, they should be removed; but there is not yet sufficient evidence to show that exploratory operations for the removal of glands which are not obviously diseased are likely to be attended by success.

Recurrence of the disease, whether of the lip or of the glands, or both, should be removed as soon as it is observed, provided it is accessible to operation and the general condition of the patient offers no obstacle to the performance of an operation.

The prognosis in such cases is bad.

With regard to the method of performing the operation and the selection of cutting or destructive instruments, the operator will be guided by the situation and extent of the disease and the general condition of the patient.

CHAPTER XI.

PAROTID GLAND.

The parotid gland appears to be subject to several varieties of malignant tumour, to round- and spindle-celled sarcoma, and to the hard and soft forms of spheroidal-celled carcinoma. But it is very difficult to decide on the relative proportions of these growths, not only to each other, but to some of the varieties of innocent tumour which are of more or less frequent occurrence in this region. The sarcomas, particularly, are seldom pure and uniform in structure. Mingled with the round and spindle cells are cartilage and mucous tissue, and many of them contain gland tissue, or a tissue closely resembling gland tissue. Fibrous tissue and cysts are also frequently observed in them. The proportion of cartilage and mucous tissue is sometimes so large that it is very uncertain whether the tumour is a chondrifying or mucous sarcoma or a primary chondroma or myxoma. The carcinomas are not so mixed in structure; but the mingling of gland structure with the sarcomas occasions a difficulty in deciding between some of the examples of sarcoma and carcinoma, and some cases of adenoma have apparently been mistaken for carcinomas, or the reverse.

As far as we are able to judge, carcinoma of the parotid gland is a very dangerous and fatal disease, nearly, if not quite, as intractable as carcinoma in any other part of the body. It is often from the first, or from a very early period of its existence, intimately connected with the structure of the gland. It grows usually rapidly, so that it may attain a large size in the course of a few months. On the other hand, instances are not wanting to prove that its course may be very slow. As it increases in size it involves the entire gland, and invades the surrounding structures. The lymphatic glands in the neighbourhood may be diseased, but this is by no means invariably the case, for both von Winiwarter (*Beiträge*) and Minssen (*Ueber gemischte Geschwülste der Parotis*, Göttingen, 1874) have recorded instances of what appeared to be certainly carcinoma, in which, even after a long existence of the primary tumour, there was no affection of the glands. Secondary growths may occur in the liver, distant lymphatic glands, and other parts of the body, and the generalization may take place within a few months of the appearance of the primary tumour; but generalization does not appear to be of very frequent occurrence. The chief malignant properties of parotid carcinoma appear to be its tendency to involve the healthy tissues which lie immediately around it, and the consequent difficulty of so completely removing it that there shall not be a speedy recurrence. These features of the disease are so strongly marked that they completely throw into the background the rarer secondary affection of the lymphatic glands and other organs and tissues. Both males and females are subject to parotid carcinoma; and, although Busch has reported one instance in a boy eleven years of age, it is a disease essentially of adult age, and rather of the middle and the later periods of adult life. The manner in which death is produced is various. The growth may reach the skin and ulcerate, and death may be due to causes connected with this accident; or there may be pressure on the food- and air-passages, or secondary growths may prove fatal by affecting vital organs.

Sarcoma of the parotid, whether in the pure or mixed forms, appears to be a far more benign disease than sarcoma of most of the other parts of the body. The tumour usually grows slowly, and at the end of two or three years may be no larger than a chestnut, or even a hazel-nut. It is encapsuled, and separates for the most part easily from the gland. It has little tendency to invade the skin or ulcerate. The neighbouring lymphatic glands are rarely affected, and there appears to be little probability of affection of the distant organs and tissues. In occasional instances, however, the tumour attains a very large size, recurs repeatedly after removal, and exhibits a much graver malignancy.

Both males and females appear to be almost equally liable to parotid sarcoma, which, like parotid carcinoma, is essentially a disease of adult age. Billroth, speaking of the enchondromas and myxo-sarcomas of the parotid gland, says that the majority of them which had come under his care originated between the ages of ten and thirty. The majority of the patients whose cases I have collected from various sources, from Billroth's clinical reports among others, were older than this.

Billroth also considers that the occurrence of facial paralysis from the pressure of a parotid tumour is to be regarded as a sign that it is probably carcinoma, for the sarcomas and other tumours rarely produce paralysis by pressure, although paralysis frequently follows the operation for their removal.

Methods of Operation.—The removal of a sarcoma of the parotid is sometimes an operation of little difficulty and practically of no danger; but the larger mucous and chondrifying sarcomas can only be removed by a difficult dissection, while the removal of the carcinomas is a matter of the gravest difficulty and danger. Large veins are wounded and bleed abundantly, and the carotid artery may be cut.

No one incision or operation will serve for every instance of parotid tumour, whether sarcoma or carcinoma. But the line of incision which is commonly observed is a vertical incision at the posterior margin of the tumour, and this is usually supplemented by a transverse incision from the centre of the first across the tumour from behind forwards. The flaps which are formed in this or any other way are turned back, and the surface of the growth is thoroughly exposed. If it is encapsuled, it may sometimes be shelled out without difficulty. But whether it is encapsuled or not, if it is adherent it must be removed by a careful dissection, the edge of the knife being kept always close to it, so as, if possible, to avoid wounding any important artery or, worse still, the facial nerve. If the nerve is stretched out over the tumour, it may be dissected off its surface, the operator working as far as possible in the long axis of the nerve. This is of course difficult when the nerve lies, as it not uncommonly does, on the under surface of the growth. The lower margin of the tumour is then usually raised up from its bed, and the dissection is carried up beneath it. It is still more difficult to preserve the nerve if it passes through the middle of the growth, yet it has in some instances been dissected out.

When the tumour has been removed, the bleeding vessels are ligatured or twisted, the wound is thoroughly cleansed with antiseptic liquid, a piece of drainage-tube or tissue is inserted, and the edges are brought together. When a considerable depression is left by the removal of the growth, the best dressing is a sponge separated from the line of incision (to prevent it from becoming adherent) by a piece of gutta-percha tissue or a layer of carbolic-oiled lint, and bound firmly in place with a bandage. It prevents abundant oozing, and encourages the early healing of the wound.

In the course of from one to three or four days it may be replaced by an ordinary dressing.

Wells's clamp-forceps will be found exceedingly useful in arresting the hæmorrhage during the performance of the operation, not merely for preventing a larger loss of blood than is desirable, but to permit the operator to perform his difficult task more easily.

The question may be raised whether it is desirable to ligature the carotid artery before proceeding to remove a large and deeply seated tumour of the parotid. My own feeling is strongly opposed to the preliminary ligature, on the ground that, if the tumour is so large or so situated as to render such an operation expedient, it is useless, or worse than useless, to attempt to remove it.

With regard to the facial nerve, Billroth says that, in the great majority of cases of removal of malignant parotid tumours, facial paralysis follows the operation. When the trunk of the nerve has been divided, the paralysis usually is permanent. But when single branches are divided, improvement may follow, even if it be delayed for more than a year. I do not know whether the two ends of the nerve have been fastened together after simple division, but there seems no reason to believe that suture of the facial nerve need be less successful than suture of other motor nerves.

Results of Operation.—*Deaths due to Operation.*—I have already said that the mere removal of a parotid sarcoma of moderate size is not a dangerous operation. Of twenty-nine patients for whom the operation was performed, two died. In one of these the tumour was recurrent and of vast size, and the man, who was old, died of shock within a few hours after the removal. In the other, the tumour was only the size of a hen's egg, but two days after its removal the patient died of some blood-poisoning, which appeared to be diphtheritic in character. Most of the tumours in these twenty-nine cases were of small or moderate size, but this was not by any means invariably so, for some of them are described as the size of a child's head. In two instances at least recurrent tumours were submitted to one or more operations. The mortality due to the removal of small or medium-sized growths is probably not more than 1 or 2 per cent., while that following the removal of large growths is apparently not large.

The removal of carcinomatous growths is, I suspect, much more dangerous, but I have only seventeen cases in which removal was performed. Death followed the operation in three of the seventeen, but I am not sure that the fatal result is to be attributed to the operation in one of the three. One patient died, at the end of fourteen days, of secondary hæmorrhage and pneumonia; another patient, at the end of eighteen days, of exhaustion from suppuration; and the third patient died, also at the end of eighteen or nineteen days, apparently of exhaustion, but the operation was the last of several which had been performed on him, and after death there were secondary growths in the liver and the mesenteric glands. Omitting this case from the list of those fatal from operation, there are therefore only two deaths in seventeen cases treated by removal, a comparatively small number when the adherence and character of the disease are considered and its close proximity to important vessels and nerves, but a number which I feel sure does not convey the least idea of the real gravity of the operation. It is, of course, possible to account for the small proportion of deaths by assuming that only the most favourable cases are submitted to operation, but even then I think the mortality is unduly small. That it is correct to assume that only the most favourable cases are submitted to operation is proved by a glance at Minssen's table of carcinomas: of eighteen cases which he collected of carcinoma of the parotid (I exclude three instances of epithelioma, for the disease commenced in the integument over the gland, not in the parotid itself) only twelve were treated by operation.

Cures due to Operation.—We will take first the results of the treatment of the seventeen cases of carcinoma, and then compare with them the results obtained by the operations in the cases of sarcoma. Of the seventeen patients, three died of the effects of the operation (or two only, if we consider that the third patient died of recurrence and generalization of the disease); eight were lost sight of after their recovery, but in two of these there was extensive affection of the lymphatic glands which was not removed; five died of recurrence of the disease or generalization, or were alive with disease beyond the reach of treatment; and one patient was alive and quite well six years after the removal of a recurrent tumour. This case is worthy of notice, not only because it is the sole instance of which I have a record of lasting, or anything approaching a lasting, cure produced by operation, but also because the disease presented formidable characters, and would certainly not have been regarded as likely to be cured. The operation was performed by von Bruns, on a young woman twenty years of age, for the removal of a medullary cancer which was ill-defined. In the course of a few months a small, round, movable nodule began to form at the lower end of the scar, and grew slowly and without pain until it reached the size of a hen's egg. It then became the seat of sharp radiating pains, which obliged the patient to seek further assistance. When the tumour was removed, it was as large as a goose-egg, and was only taken away with considerable difficulty, leaving the woman exhausted. But she made a good recovery, and was quite well and free from all signs of the disease at the end of six years from the second operation. Minssen justly remarks that the result was of the rarest. It is the only instance of a cure of carcinoma by operation which I have to offer.

The case is very different for sarcoma. The results are so much better than for almost every other part of the body that I am sometimes tempted to doubt whether there has not been a mistake in the estimate of the real nature of the tumour. Many of the most successful results are, however, reported from Billroth's clinic; many of the tumours, if not all of them, were examined by competent microscopical observers, and were regarded as clear examples of myxo- and chondro-sarcomas.

Of the twenty-nine cases treated by operation, death occurred from the results of the operation in two; three patients were alive with, or died of, recurrence of the disease; six patients were lost sight of within a year of the last operation; and the remaining eighteen were well and free from all sign of disease at the end of from sixteen months to eight years after the last operation. Looking more closely at the duration of the success in these cases, it was between one and two years in two of them; between two and three years in five; between four and five years in five; five years in one; six years in three; eight years in one; and "some years" in one. There are therefore no fewer than eleven thoroughly successful cases on the three-years' limit, a result which must be admitted to be admirable.

Of the most successful cases, it may be shortly stated that the tumour, in the large majority of them, was of small or moderate size, and removed with little difficulty; that it was not complicated by affection of the lymphatic glands; and that a single operation sufficed to rid the patient completely of the disease. There are several instances of operations for recurrent tumours, and, although there is not evidence to show that they were all unsuccessful, there is not, on the other hand, any record of complete success.

Are patients who are not cured, benefited by operation? In answer to this question, I may point to the seven cases of patients well and free from sarcomatous disease at the end of from one to three years after the operation. They must be classed as relieved, for the duration of relief cannot place them in the list of "cures."

Of the relief afforded by the operations for carcinoma I am not so sure. Recurrence *in situ* speedily followed the removal of the tumour in most of the cases, and the disease produced the same results as if it had never been removed.

It must be borne in mind that, after the removal of both the carcinomas and the sarcomas, there followed in many instances more or less complete and permanent facial paralysis.

Conclusions.—As far as the very small material at our disposal allows us to judge, the treatment of carcinoma of the parotid by operation can seldom be undertaken with a reasonable prospect of complete success.

Even as a palliative measure, operation does not appear to have been attended with great success.

On the other hand, small or moderate-sized sarcomas which are not adherent or complicated may be removed with an excellent prospect of completely ridding the patient of the disease.

CHAPTER XII.

JAWS.

UPPER JAW.

There are difficulties in dealing with the tumours of the upper jaw which are not experienced in dealing with the tumours of the long bones, and the chief of these difficulties is to determine the origin of the disease. The tumours of the antrum grow from different structures, and it is usually quite impossible to discover whether the sarcomas are of central or sub-periosteal origin. Some malignant tumours which are usually described as tumours of the upper jaw take their origin in the ethmoidal or sphenoidal cells; others grow from the nose into the antrum. The account, therefore, of the malignant tumours of the upper jaw, and the records of the results of operations performed for their removal, are not so accurate from a scientific point of view as those of many other parts of the body. I hope, nevertheless, it may be possible to give a general outline of the course of the disease, as it is observed in the very large majority of instances, such as may be useful in relation to operative surgery.

To begin with, let me state that I shall employ "upper jaw" and "antrum" as synonymous terms, for I have no intention of dealing in this section with the tumours which affect the adjoining sinuses or bones, or even with the tumours which are limited to the alveolar process of the upper jaw. Nor shall I do more than mention those operations which consist in cutting away a part of the wall of the antrum for a growth situated within the substance of the bone, or in the removal of part of the nasal or the palatine process. The tumours I am about to describe are such as affect the antrum, and require the complete, or almost complete, removal of the upper jaw-bone.

Both sarcoma and carcinoma may affect the antrum, but the larger number of malignant tumours appear to be carcinomas. Again, almost every variety of both sarcoma and carcinoma may be found, but the majority of the sarcomas are round-celled and the majority of the carcinomas are spheroidal or squamous-celled. For our purpose it does not seem necessary to separate the sarcomas from the carcinomas in the consideration of the general course pursued by the disease; but it is necessary to devote especial attention to one form of carcinoma on account of the peculiar course which it pursues. I refer to the squamous-celled carcinoma or epithelioma.

Carcinoma is a disease of adult age, and rather of advanced adult age, while *sarcoma* is often found in younger persons, and may even occur in children. Both sexes are liable to both forms of disease, but they attack men more frequently than women. Sometimes the appearance of the tumour is preceded by pain, but in many instances there is no pain until the disease is advanced. The first sign of serious disease is the appearance of a swelling of the face over the antrum or of fulness and obstruction of the corresponding side of the nose. With the fulness of the nostril there may be discharge of bloody fluid. The swelling gradually increases, not only in the directions in which it first was noticed, but also up towards the orbit, down towards the mouth, and back into the spheno-maxillary fossa. The eye may be pushed up and the hard palate pushed down, but the swelling in the fossa is not so easily perceived. The nostril on the affected side often becomes completely obstructed. As the disease advances, the bony wall may be destroyed and protrusion may take place, with affection of the soft parts around the bone. The skin of the face in this way becomes adherent to the tumour and immovable over it, and the result may be a vast ulcer, with the thrusting forth of a fungous mass. The neighbouring sinuses are frequently involved, so that the tumour may reach the horizontal ethmoid plate and thence extend into the interior of the skull. The lymphatic glands, whether in front of the ear or behind and beneath the lower jaw, are seldom affected, yet I have seen them enlarged in very rare instances at a comparatively early period of the disease. The rule, however, is that the tumours of the antrum either do not affect the glands, or only do so when the disease is very advanced. The tumour may kill by the local effects which it produces, whether it extends to the interior of the skull or not, or dissemination may take place in the liver, lungs, skin, bones, and other organs and tissues. The natural duration of the disease varies much according to the character of the tumour. The round-celled sarcomas and the softer forms of carcinoma run a rapid course, and may prove fatal in less than a year, but the myeloid and the spindle-celled tumours may exist a much longer time without producing death.

Squamous-celled Carcinoma (epithelioma) attacks men and women, but men more frequently than women. It is a disease of middle and advanced adult age. The formation of the tumour probably commences in the mucous membrane of the alveolar process in connection with a carious tooth, or stump of a tooth, or in the socket from which a tooth has been removed. There is usually very little swelling of the affected portion of the bone, and the earliest symptom of the disease is violent toothache. To relieve this pain one or more teeth may be extracted, and as the apparent result of the extraction, or independently of it, a sinus forms, through which there is a discharge of fetid pus. A probe passed into the sinus may strike on crumbling bone, or, and this is commonly the case, may pass directly up through the alveolar process into the cavity of the antrum, which may feel as if filled in whole or part with soft tissue resembling granulation tissue. Even now, and although the patient's toothache has not been relieved by the removal of the teeth, the real nature of the malady may be unsuspected, for it is singularly insidious. The epithelial growth extends into and fills the antrum, destroys its bony walls, reaches the lower wall of the orbit and destroys it, passes up into the sinuses in the ethmoid and sphenoid bones, reaches the base of the skull, gives occasion to great pain, yet presents even to close examination scarcely any sign of a tumour. The new growth replaces the destroyed structures and fills cavities, but seldom grows so far beyond or out of them as to produce actual swelling, except such as may be mistaken for the effects of inflammation and necrosis of the bone. The resemblance to the effects produced by necrosis is still further strengthened by the sinuses which form, and which are not always limited to the alveolar process. I have seen them in the cheek, below the orbit, and by the side of the nose. The lymphatic glands are only rarely affected. The course of the disease is so rapid that within a few weeks of the first pain and sign of mischief in the alveolar process, and when there is yet scarcely any sign of actual tumour, it is already beyond the reach of operative treatment. I have myself attempted its removal by complete removal of the upper jaw within seven weeks of the first sign of any affection of the mouth, and have found that the whole of the bone was destroyed, and that the new growth had extended into the neighbouring sinuses and into the muscles around the upper jaw, so that the complete removal of the disease was impossible without running great risk of killing the patient. And I have been present at operations performed on patients whose symptoms dated from only two or three months previously, and yet, in spite of the fact that there was no visible tumour and the diagnosis was still uncertain, the disease had so far advanced that it was not found possible to remove it. Death is usually due to exhaustion, and occurs, as might be expected from the account which has been given, at a very early period of the malady. Recurrence takes place almost immediately after removal in most instances; indeed, the removal is incomplete, and the growth is continuous. I do not know how often secondary formations of the new growth occur, for there is little evidence at present on this point.

Methods of Operation.—When the disease is limited to the interior of the antrum, it may be scooped out after a sufficient opening has been made for the purpose. When the bone is implicated, the superior maxilla is removed, either wholly or with certain reservations.

Enucleation of the Tumour.—A flap of the soft parts is turned down by making a horizontal incision from the inner angle of the orbit along its lower margin, and a second incision from the angle of the orbit down by the side of the ala of the nose to its lower margin. The bleeding vessels are tied. An opening is made into the cavity of the antrum through its front wall of sufficient size to allow the interior of the cavity to be thoroughly examined and its contents to be removed. If the disease is limited to the antrum, and has not grown into its wall at any point, the tumour may be shelled or scooped out with a sharp spoon. There is not likely to be serious hæmorrhage. It may, however, be necessary to plug the cavity with a strip of lint, the end of which is brought out behind the cheek into the mouth so that it can be withdrawn the day after the operation. This same opening serves for the escape of the discharges until the healing is accomplished, and through it injections of weak carbolic or other antiseptic solutions may be introduced by means of a syringe, or powders of iodoform and borax may be insufflated. The flap which was turned down is very carefully adjusted and sewn in place with fine wire or horse-hair sutures; and, for the better insuring of healing by the first intention, collodion is painted along the line of the incision. Instead of the incision just described, a flap may be turned *up* by an incision through the upper lip along the columna, round the margin of the nostril, and along the side of the nose as high as may be needful. This is, in my opinion, the better method of performing the operation, because less deformity is left by it, the antrum is opened at its lower part, and the escape of discharges results more naturally.

Removal of the Upper Jaw.—The usual operation by Fergusson's method, in which the incision is carried along the side of the nose and horizontally along the lower margin of the orbit, is so well known and so frequently practised that it is not necessary to describe it in detail here. I prefer it to the operation in which the incision is carried up through the cheek from the angle of the mouth, both on account of the greater freedom with which it permits the operation to be performed and of the less marked scar. But there is undoubtedly a defect which not infrequently results from Fergusson's operation which has not received the attention it deserves. When the lower margin of the orbit has been removed, the lower eyelid often swells, becomes red and œdematous, and may remain so in spite of every means taken to relieve it. The disfigurement produced by this cause is very marked, and is, I think, not less than that which results from the lower incision. The chief reason, then, for selecting Fergusson's incision is that it allows the operation to be more easily performed and the hæmorrhage to be more readily controlled. After the removal of the bone, the edges of the wound are brought together with the greatest care, especially about the angle of the orbit and at the lip, to preserve the line of the prolabium. The line of incision is painted with collodion, the cavity filled with long strips of lint or gauze, and the patient returned to bed. The lint is usually removed on the day after the operation, but may be left another day if there is fear of hæmorrhage. The chief points in the after-treatment are to keep the cavity sweet, and to see that the patient takes a sufficient quantity of food. The first indication may be fulfilled by frequent gentle syringing with solutions of antiseptic materials, or, better still, by the insufflation two or three times a day of powders composed of iodoform and borax in equal quantities or with as much more iodoform as may appear necessary in the individual case. The second indication may be met by feeding the patient through a syringe or funnel or tube. These points will be again referred to in the discussion of the results of operations.

Removal of the Upper Jaw, with the Exception of the Orbital Plate, may be performed through the same incision as in Fergusson's operation along the side of the nose, but the horizontal incision may be omitted, or may be modified by much shortening its length. Guérin, according to Stephen Smith, recommends, instead of this incision, one slightly convex backwards, commencing at the ala of the nose and terminating at the corresponding commissure of the lip, following the naso-labial fold or furrow. The two flaps resulting from this incision are dissected up until the nostril is opened and the malar process is completely denuded. I have never seen this method employed, and can scarcely imagine that sufficient space for so formidable an operation can be afforded by it. Indeed, S. Smith's sketch of the further steps of the operation lead me to believe that only the alveolar process and the portion of the jaw immediately above it are removed. When the soft parts have been raised off the bone by one or the other of these incisions, the alveolar process and palate are cut through as in the major operation, the soft palate having been detached from the posterior margin of the hard; the malar process is sawn or cut through in a direction from above downwards and from within outwards, and a section of the bone is made from the malar process through to the nostril by means of saw or cutting forceps just below the orbital plate. The bone is then removed by wrenching it out with the lion-forceps and dividing the soft parts which are still adherent to it; the hæmorrhage is arrested; the under aspect of the orbital plate is examined to be certain that it is free from disease; and the outer wound is closed, the cavity being treated in the same manner as when the whole jaw has been removed.

I do not think the actual danger to life from this operation is much, if at all, inferior to that due to the removal of the entire bone, for the smaller portion removed and the smaller incision through the soft parts are more than compensated by the greater difficulty in arresting the deep hæmorrhage and the longer time which is often necessarily consumed. But the result, so far as personal appearance and comfort are concerned, well repays the trouble taken in the operation. This modified operation is, of course, only applicable to cases in which the disease is limited to or chiefly affects the lower part of the bone.

Results of Operations.—*Mortality due to Operation.*—In order to illustrate this point, I have collected 108 cases, taken from the following sources:—The *St. Bartholomew's, Middlesex*, and *University Reports*, forty-two cases; von Winiwarter's *Beiträge zur Statistik der*

Carcinome, eight cases; Fischer (from Rose's Klinik), twelve cases; Ohlemann (from Baum's Klinik), *Langenbeck's Archiv*, xviii. 463, 1875, nineteen cases; Lücke (from Langenbeck's Klinik), *Langenbeck's Archiv*, iii. 291, 1862, eighteen cases; and Heyfelder, *Resection des Oberkiefers*, 1857, s. 55, nine cases. With very few exceptions, the operation was performed for malignant disease. In more than one instance, both superior maxillary bones were removed at the same time, but the number of cases in which this was done is not large enough to affect the general statistics of the operation.

Thirty-two of the patients died of causes connected with the operation, so that the total mortality is as nearly as possible 30 per cent.—a very large mortality, equal to that of amputation of the thigh in the upper half (for disease), or perhaps exceeding it. I confess I was surprised to discover so large a percentage of mortality, for I had held an impression that excision of the upper jaw was, for its magnitude, not so serious a proceeding, and rather expected to find that the mortality was about 12, or perhaps as high as 15 per cent. I have therefore looked closely into the matter, in order to discover, if possible, whether the figures which have been adduced represent fairly such a mortality as may be expected to follow the operation at the present time.

In the first place, of course many of the operations were performed many years ago, before the general improvement in the statistics of operations commenced. In Lücke's eighteen cases, for example, the operations were performed between the years 1851 and 1861; in Heyfelder's, before the year 1857. Ohlemann's commenced in the year 1856, and were completed in 1874. It is only to be expected that the mortality of these series should be much larger than that of series which have occurred since 1874. Curiously enough, however, this is not so. The three series give a total number of forty-six cases, with a total mortality from the operation of fifteen—a mortality, therefore, very nearly equal to that of the whole number of cases. Again, Ohlemann's series of nineteen cases, in which the operations were performed between 1856 and 1874, contains the smallest number of deaths—only three; whereas, von Winiwarter's series of eight cases, in which the operations were performed in Billroth's Klinik some years later, shows a mortality of four cases. Further, comparing the results of the practice at St. Bartholomew's Hospital in the earlier and the later years, between 1870 and 1886, I do not find any improvement in the operations on the upper jaw, and certainly no improvement corresponding with what has been observed in the larger operations on other parts of the body.

The causes of death are mentioned in thirty of the thirty-two fatal cases. They are as follow :—

Hæmorrhage	1
Meningitis and abscess of brain	3
Gangrene of lung, 2; bronchitis and pneumonia, 3	5
Collapse, 1; shock, 2; anæmia and exhaustion, 9	12
Typhus	1
Erysipelas, 4; pyæmia and septicæmia, 4	8
Total	30

The only causes which can be regarded as peculiar to this operation are meningitis, abscess of the brain, and the pulmonary affections. The cerebral affections were due to interference with the base of the skull, or even the membranes of the brain ; the pulmonary affections were of the same kind, and probably due to the same conditions, as those which occur after the removal of the tongue. The case of typhus must be regarded as an accident, only in part connected with the operation. There then remain the ordinary causes of death after a severe operation—hæmorrhage, shock, collapse, exhaustion, erysipelas, and general blood-poisoning, making a total of twenty-one cases. I cannot help thinking that, whether we consider the special or general causes of death, the total mortality is excessive for an operation of this magnitude. The danger from hæmorrhage and shock is evidently small, for only three or four deaths are attributed to these causes. The chief dangers arise from exhaustion, blood-poisoning, and pulmonary affections ; and there does not seem to be the least reason why successful measures should not be taken against them as they have been taken against the same class of dangers after the removal of the tongue. It is almost certain that the pulmonary affections which have proved fatal after the removal of the jaw are, in the large majority of instances, of a septic nature ; and it is quite possible, nay probable, that the inflammation and suppuration in the interior of the skull are of the same kind. If the dressing of the wound could be made aseptic, there seems every reason to hope that the dangers arising from these causes, and from erysipelas, pyæmia, and septicæmia, might be reduced to a minimum. Nor does there appear reason to believe that the number of instances of fatal exhaustion must remain as it stands in the list of causes of death. Probably some of the deaths attributed to "exhaustion" were really due to blood-poisoning or pulmonary affection, as the result of which the patients slowly sank and died. But it is also certain that some patients die solely of exhaustion during the first few days or later after the operation; and their exhaustion is due, not merely to the severity of the operation, but to the insufficient quantity of nourishment they are able to take. It seems quite clear that, if we are to reduce the mortality of removal of the upper jaw, we must adopt two courses in the after-treatment of the patients: first, such means as will render the wounds aseptic; second, regular and sufficient administration of food.

It is, of course, difficult to apply the Listerian method to the dressing of wounds made in the removal of the upper jaw, and I am not surprised that I have not met with any account of its systematic application in any series of cases. On the other hand, there is no greater difficulty in treating these wounds successfully than there is in treating wounds made by the removal of a large part of the tongue. The wound should be thoroughly cleansed after the operation has been completed, and should be dusted over with iodoform, or iodoform and borax, or carefully packed with long narrow strips of iodoform gauze. In most cases, the latter dressing will be preferable on account of the advantage which the packing has of arresting the oozing of blood, which is sometimes considerable. The packing may be left in place for several days, and, as portions become detached, they may be replaced, and the whole surface may be kept sweet by occasionally powdering it with iodoform and borax, or washing it with a weak solution of Condy's fluid or carbolic acid.

The patient should be fed regularly during the first few days after the operation, twice or three times a day, through a funnel or syringe and tube; and, if this method of feeding cannot be endured, it may be replaced by the administration of food by the rectum in the form of nutrient suppositories, such as Slinger's.

I hope and believe that another series of 100 cases, with the precautions recommended, would present a mortality of not more than eight or ten.

Cures due to Operation.—In this section we are doomed to meet with great disappointment, partly on account of the large number of cases in which the patients were lost sight of after the operation, partly because the results of the cases which were followed up are very bad.

Of the seventy-six patients who recovered from the operation, forty-four were lost sight of after they had left the hands of the surgeon, or at least their further history is not recorded. Twenty-three were known to be dead or dying of recurrence, four had died of other causes, and five were still alive and well. I shall say nothing of the patients who were lost sight of, although several of them were certainly not likely to remain long without recurrence, the disease not having been removed so freely as to offer anything like a reasonable chance of cure. But it would not be just to take these cases into consideration without, at the same time, picking out such cases as might appear very likely to be permanently relieved by the operation.

Of the patients who were dead or dying of recurrence, the recurrence was in nearly all instances in the cavity left by the removal of the jaw; but in a few cases the term is used to express affection of the lymphatic glands below or behind the jaw, and does not refer to reappearance of the disease *in situ*. In one case the recurrence did not take place until nine years had elapsed since the operation, and this case may therefore be classed as a cure on the three-years' limit.

The four patients who died of other causes died of pneumonia (two), phthisis, and some unknown cause, perhaps of malignant disease in some internal organ. Death occurred in three of the four within six months or less after the operation, so not one of the three can be claimed as cured. In the fourth case the patient lived eight years, then died of pneumonia; the case, therefore, counts as one of cure.

Of the five patients who were alive and well at the time of the last report, the period of sound health was from one year to many years, but only two of them had passed the three-years' limit. In the other three, from one to two years had elapsed.

Out of sixty-four cases, therefore, of which the result is recorded, only four can be regarded (from the three-years' limit) as successful, and in one of these the disease re-appeared at the end of nine years. The prospect of surgical treatment is very gloomy, and I doubt whether it is not made even more so by a close examination of the most successful cases. The instance of long-deferred recurrence is recorded by Ohlemann. The primary disease commenced in the alveolar process of the jaw, somewhat in the same manner as "boring epithelioma;" but, instead of running the rapid course of that disease, it was of very slow growth, and its microscopic characters rather resembled those of the epithelioma described by Eve than the true squamous-celled carcinoma, which is so malignant. At the end of eight years a new growth formed in the cavity of the nose, and proved fatal in about a year. The patient who died of pneumonia at the end of eight years was one of Rose's patients, recorded in Fischer's paper. The disease was a giant-celled (myeloid) sarcoma, a variety of sarcoma characterized by a very low degree of malignancy. The third case is reported by Heyfelder. The tumour is said to have been "sarcoma;" it had been growing seven years, and had reached the size of a goose-egg at the time of the operation. The fourth case also comes from the Heyfelder Klinik. The disease is described as "cysto-sarcoma phyllodes," and the report is "*bleibende Heilung*," which I have taken to mean three or four years, as the operation was performed in 1853 and the report was published in 1857. Of the exact nature of the growth in these two cases little can be said, for the operations were performed more than thirty years ago, and there is no description of it; but the name of the last tumour, and the slow growth of the "sarcoma," lead me to believe that the disease was not nearly so malignant as most sarcomas and carcinomas of the upper jaw.

Are patients who are not cured, relieved by operation? To this question the answer will probably be, Yes, in those cases in which the tumour has been the seat of great pain, and in which there is no recurrence *in sitû*. Unfortunately, recurrence takes place in a large proportion of cases at a very early period after the removal of the disease, and the suffering produced by the recurrent disease is as great as that due to the original tumour, nor is there usually the least prospect of operating successfully on the recurrent disease. And it must be borne in mind that, in those cases in which the floor of the orbit has been removed, there often results serious disfigurement and an unhealthy condition of the eye, which may be even quite destroyed. The answer to the question, therefore, cannot be given with the same confidence as when the proposed operation is for removal of the breast or testicle and similar parts.

Conclusions.—The results afforded hitherto by removal of the upper jaw for malignant disease, whether carcinoma or sarcoma, are very unsatisfactory.

The mortality due to the operation is very large.

The relief procured by it is very small, for the number of those who can be claimed to have been cured is very small, while the relief afforded to those who cannot be regarded as cured is neither large nor certain.

Unless there is a reasonable hope that better results will be procured in future, the operation must be condemned.

I am not sure whether a fair prospect can be held out that the operation will be followed in a much larger number of instances by permanent success.

But there is good reason to believe that the mortality due to the operation may be largely diminished by the adoption of such measures as those which have been indicated.

Finally, it is of the greatest importance that the later results of operations from which recovery has taken place should be ascertained and published, for the material at present within reach is very imperfect.

LOWER JAW.

Although it is possible to separate the central from the subperiosteal tumours of the lower jaw, and the study of the malignant diseases of the lower is on this account easier than that of the malignant diseases of the upper jaw, there are nevertheless certain difficulties in the perfect comprehension of the subject. In the first place, the process and disorders of dentition undoubtedly exercise an influence on the occurrence and structure of some of the malignant tumours, and, although this influence may not be largely felt in the course of the disease, the modifications of structure are apt to mislead the student in his classification of these tumours. In the second place, squamous-celled carcinoma (epithelioma), commencing in the mucous membrane of the gum, not infrequently penetrates into the interior of the bone, and may usurp the place and position and some of the characters of a tumour of the bone of central origin, from which it ought certainly to be separated both in regard to theory and practice. And, to make this part of the subject still more complex, recurrent tumours of the lower lip involving the jaw, and primary tumours of the floor of the mouth growing on to and into the bone, are frequently spoken of as tumours of the lower jaw. And last, but by no means least, Mr. Eve in his lectures at the Royal College of Surgeons, and in a very able paper, "Cysts and Encysted Solid Tumours of the Jaws," read before the Odontological Society (see *Transactions*), has taken the view that many of the cystic tumours of the lower jaw are of epithelial origin and essentially epithelial, and has applied to them the term "epithelioma." I hold a different view to that of Mr. Eve, but the present is not a favourable opportunity for the discussion of the question. Even if I held the same view of the origin and nature of these growths, I am not sure that it is wise to apply to these tumours a name which is likely to lead to some confusion.

Mr. Heath, in his third edition of *Injuries and Diseases of the Jaws* (1884), has done much to render the study of maxillary growths more simple than it formerly was, but I could wish that, in dealing with the sarcomas of the lower jaw, he had separated the central from the sub-periosteal tumours, and I would further venture to point out that confusion is likely to arise in the mind of the reader from the titles of some of the chapters. For example, chapters xx. and xxiv. are entitled respectively "Malignant Tumours of the Upper Jaw" and "Malignant Tumours of the Lower Jaw," while chapters xix. and xxiii. are entitled respectively "Sarcomatous Tumour of the Upper Jaw" and "Sarcomatous Tumours of the Lower Jaw." The inference therefore is that sarcomatous tumours of the upper and lower jaws are not malignant tumours. And the difficulty is made still greater by the inclusion of the round-celled sarcomas in the chapters on malignant tumours, not in the chapters on sarcomatous tumours.

In the following pages I shall treat only of the sarcomatous tumours of the lower jaw, not because the epithelial growths are not important and worthy of consideration, but because of the difficulties which have been alluded to. The large majority of the cystic tumours will therefore not be included among the cases to which reference will be made, for only a few of them appear to have presented a distinctly sarcomatous structure. And I shall separate the tumours of central from those of sub-periosteal origin, both on account of the great difference in the course which they pursue and on account of the difference in the treatment which may be needed for them. Of course it is not possible, with every care, to certify the exact origin of every sarcoma of the lower jaw; for, in addition to the extensive destruction of the bone in advanced cases, there is always a difficulty in classifying those growths which arise in the alveolar border (probably from beneath the peri-odontoid membrane) and make their way between the outer and inner plates of the bone, expanding them as if they had been truly growths of central origin.

The *sub-periosteal tumours* may be round-, spindle-, or mixed-celled sarcomas, and are not uncommonly in larger or smaller part fibrified, chondrified, ossified, or calcified. In this respect they resemble the sub-periosteal sarcomas of other bones, and differ from the tumours of central origin. They may occur in children as well as adults, and appear to attack adults rather in the earlier than the later periods of life. They may affect any part of the bone, and may grow from the outer or the inner aspect, but grow from the body much more frequently than the ascending ramus, and often, in their growth, involve both aspects of the bone. They grow quickly, are not encapsuled, involve the muscles and other structures in the immediate vicinity of the bone, and sometimes attain considerable size. They are not associated with affection of the neighbouring lymphatic glands, unless they involve them in their continuous growth. After removal, they usually recur speedily, and with each recurrence are more difficult to remove. The course of the disease is almost always very rapid, and the patients die from exhaustion due to the growth and ulceration of the recurrent tumours, or from secondary affection of other organs and tissues. Among the structures which are the seat of secondary growths are the lungs, the liver, distant and dissociated lymphatic glands, &c.

The *central tumours* may be round-, spindle-, mixed-, or giant-celled, but the giant-celled are of most frequent occurrence, for the lower jaw is the seat of election of this variety of sarcoma. Great differences are observable between the tumours of central and those of sub-periosteal origin. The central tumours are much less disposed to organization and calcification. They may attack persons at any period of life, and may grow in the interior of any part of the bone, though almost invariably in the sides or front, not in the ascending ramus. But they usually grow slowly, so that they may occupy years instead of months in attaining a considerable size. They are, of course, contained within the bone until a large size has been attained, when they may make their way into the surrounding structures; but even then they do not exhibit the same tendency to infiltrate which is so notable a feature of the sub-periosteal tumours. They are rarely associated with affection of the neighbouring lymphatic glands or with secondary growths in other organs and tissues. With regard to the relative malignancy of the varieties of sarcoma, there can be little question that the myeloid or giant-celled is the least malignant; but it must be admitted that a part of the more favourable judgment which has been expressed regarding myeloid tumours is probably due to the great interest they have for many years inspired, and the consequent care which has been taken in following up the histories of the patients who have suffered from them.

The giant-celled sarcomas have sometimes been described as a disease of childhood or of very young adult life, but I cannot find in a collection of actual cases a confirmation of this view, and should myself say that they occur more commonly in persons in the middle period of life than earlier.

Occasionally, cysts are found in the sarcomas of central origin; in fact, some of the large multilocular cystic tumours are sarcomas. But the great majority of these tumours are structurally not sarcomatous, and are clinically innocent.

Methods of Operation.—For tumours of sub-periosteal origin there is only one method of treatment which should be employed: resection of the affected portion of the bone and removal of as much of the surrounding soft parts as ought to be and can be removed without serious danger to life. In this way, and only in this way, is there any prospect of preventing the local recurrence of a disease which is peculiarly marked by the tendency to recur *in sitû.*

But for tumours of central origin it suffices, in many instances, in the first removals at least, to gouge or scrape the tumour out of the interior of the bone, reserving the more formidable proceeding for recurrent disease or for tumours which are of great size and formidable aspect.

In the descriptions of the various operations I shall avail myself largely of Mr. Heath's work, not only on account of the large personal experience he has had, but because he has embodied with his own the experience of other surgeons whose names have been associated with the removal of the lower jaw.

A small tumour seated in the interior of the jaw towards the front part of the bone may be removed by the following method:—Chloroform having been administered, and the mouth thoroughly opened by means of a gag or the dentist's vulcanite prop inserted on the side opposite to the tumour, the mucous membrane and soft parts are separated from the bone where the growth is most prominent or the bony wall is thinnest. A sufficiently large opening is made into the cavity by cutting away the wall, and the tumour is shelled or gouged out of the interior of the jaw. In some instances the cavity in which it lies is perfectly smooth-walled, and the removal of the growth is effected in a few moments; in other cases it must be carefully scraped out. When the opening is made on the outer aspect of the bone, it is necessary to separate the structures of the cheek widely from it, in order to gain free access to the disease and to arrest the bleeding. It must not be forgotten that when the tumour is seated far back in the body of the jaw there is danger of wounding the facial artery. To avoid this accident, which might prove serious, it is necessary to keep close to the bone, and better to use a bone elevator than a sharp instrument in raising the soft structures off the surface of the jaw. After the thorough removal of the disease the cavity is sponged out, bleeding arrested, and the interior dusted with iodoform. During the healing, iodoform is used once or twice every day, and the mouth is kept clean by means of antiseptic washes.

Resection of the affected portion of the bone, when the disease is situated towards the front and is of small extent, is a simple operation, but in performing it one or two points should be taken into account. An anæsthetic is administered (usually chloroform), and the mouth is held open by a gag or prop; the cheek is held down and away from the tumour with a retractor, so as to obtain the best light and exposure possible, for it is not necessary to divide the external parts. If the tumour is central, the soft parts are raised off the surface of the bone. A tooth is removed at each end of the tumour, the bone is divided through the sockets, either with bone-forceps or a small saw, and the piece of bone including the disease is taken out. The bleeding is easily checked by the cautery, by pressure, or the application of cold water, and perhaps one or more small vessels may need to be tied in the divided soft parts. The surface of the wound is dusted over with iodoform, and this is the only dressing which is likely to be required during the healing. The points which must be borne in mind are these—the relation of the facial artery to the disease, which will, of course, in the large majority of cases to which this operation is applicable, be at some distance behind, and the possibility of preserving the lower line of the jaw undivided. In cases in which it is of great importance to operate wide of the disease, the preservation of the line of the jaw must be a secondary consideration; but in cases in which the disease is central and does not reach to the lower line of the bone, it is not necessary to completely divide the bone. In such cases a horizontal incision is made with a fine saw between the lower margin of the tumour and the lower margin of the jaw.

When the disease is of large extent, it is necessary to remove one-half of the bone, and, for this purpose, to incise the external parts. For, although it has been found possible to remove one-half of the bone through the open mouth, there is so much difficulty in doing so, and so much danger from hæmorrhage, that the intention of avoiding an external scar is not justified. Even in the removal of innocent tumours this proceeding is rarely safe; it is much less applicable to malignant tumours. When the external parts have been divided, it is still requisite that the jaws should be kept asunder by means of a strong gag or prop. An incision is made along the posterior border of the bone or tumour from the level of the lobule of the ear to the median line, and, if needful, on account of the large size of the tumour, a vertical incision may be carried through the lip. The facial artery is tied and the soft tissues are raised. A tooth is extracted in front of the tumour, and, through the socket, the bone is divided with a saw or large pair of bone-forceps. The affected half is drawn outwards with the lion-forceps, and the tissues are divided close to it on the inner side. In performing this part of the operation, the knife must be kept close to the bone for fear of wounding the lingual nerve or the sub-lingual or sub-maxillary glands. In order to free the coronoid process, the jaw is drawn forcibly downwards. The internal maxillary artery and the facial nerve are avoided by keeping close to the inner and outer surfaces of the ramus of the jaw. After the coronoid process has been freed, the joint comes into view, is opened in front, the condyle dislocated, the knife carried cautiously behind it, and the bone finally removed by wrenching through the remaining fibres of the external pterygoid muscle. For the safer conduct of the later steps of the operation, a flat bone-elevator may be employed instead of the knife; there is then less danger of wounding the maxillary artery.

When the tumour is very large, a vertical incision through the lip is very desirable, in order to allow of a thorough exposure of the disease; and, as the large size of the growth may hinder the dislocation of the condyle and the freeing of the coronoid process, Mr. Heath recommends the division of the process with bone-forceps, and to remove as much of the disease as possible below the joint, clearing out the remainder and the condyle when the main mass of the tumour has been removed.

Again, when the tumour has extended so far round the front of the bone as to necessitate the removal of the symphysis, there is a danger that the tongue may fall back during and after the operation, and suffocate the patient. To avoid this accident, a thread should be passed through the tip of the tongue with which to draw it forward.

During the whole of the operation it is the duty of the assistants to keep the mouth clear of blood and to prevent the blood finding its way into the trachea and lungs. Vessels should be tied or clamped as soon as they are divided; and, when the disease has been removed, the wound must be as quickly as possible cleansed, and bleeding points secured. The surface may then be covered with iodoform powder.

After the operation, it is not usually necessary to feed the patient through a tube and funnel or by means of a Higgenson's syringe. But, if the parts removed are very extensive, and the patient's condition is seriously affected by the long duration of the disease or the severity of the operation, it is well to administer at least one such feed in the course of the day. And if there is serious difficulty in swallowing, the food should be entirely administered by such means as have been indicated. Mr. Heath suggests that, when the effects of the iodoform have worn off, other antiseptics should be employed, such as the glycerine of carbolic acid, and that the mouth should be washed out with detergent lotions. I prefer, however, for all wounds of the interior of the mouth, whether they involve the bone or not, the re-application of iodoform powder, which can be made once or twice a day, or more frequently if requisite, by means of an insufflator. I am aware that it is possible to produce iodoform poisoning, but I have scarcely ever seen a case, although I have, during the last three years, been in the habit of using powdered iodoform very freely in the mouth.

Results of Operations.—*Deaths due to Operation.*—In dealing with this question, a similar difficulty is encountered to that which is met with in dealing with operations for cancer of the tongue. The size and situation of the tumours vary so much, to say nothing of the age and personal condition of the patients, that a very wide difference exists between the operations which are practised. I am not speaking of the mere scooping of a central tumour out of its cavity, but of actual resection of the portion of bone on or in the interior of which it grows. I think our purpose will be best served by taking all the cases of resection together, without attempting to group them according to the extent or situation of the bone resected. In this portion of the subject, the central and sub-periosteal tumours may be grouped together. I have myself collected accounts of sixty cases of sarcoma of the lower jaw, from various sources, in all of which the operation of resection was practised either at first, or for recurrence of the disease after it had been previously removed by a less severe proceeding. The total number of deaths due to the operation was eight. Lücke, in the paper alluded to in the section on the Upper Jaw, gives statistics of the removal of one-half of the jaw in seventeen instances, and four of the patients died of the operation. Heath says that Cusack of Dublin operated in seven cases, with one death; and that Dupuytren operated in twenty cases, with only one death due to the operation. The total number of cases is therefore 104, with fourteen deaths due to the operation, a mortality of rather less than 14 per cent.

The cause of death is not mentioned in Dupuytren's fatal case. But in the other thirteen cases it was as follows:—

Exhaustion	5
Anæmia and exhaustion	1
Aortic stenosis (old)	1
Pneumonia	2
Gangrene of lung	1
Pyæmia	1
Erysipelas and meningitis	1
Erysipelas and œdema glottidis	1
Total	13

It is very instructive to compare the causes of death with those following the operation of removal of the upper jaw or tongue, and particularly the tongue.

Six of the thirteen patients certainly died of exhaustion, and exhaustion was probably the proximate cause of death in the seventh case, in which the patient is said to have been a sufferer from old aortic stenosis, and to have sunk fourteen days after the removal of half the jaw. Half, or more than half, the deaths were therefore due to exhaustion. In every one of these cases the operation included the removal of the whole of one side of the jaw; and in four of the seven attention is drawn to the very large size of the tumour, and the consequent severity of the operation for its removal. Pyæmia and erysipelas proved fatal in three cases, a proportion not larger than might have happened in a hundred more or less severe operations on any part of the body in which there is difficulty in maintaining a thoroughly aseptic condition of the wound. The three cases of pneumonia and gangrene of the lung I should regard as peculiarly due to the situation and character of the operation; for in all three instances the inflammation of the lung was probably septic.

When it is observed that the very large majority of the 104 resections were performed more than ten years ago, long before any improvement took place in our method of treating wounds within the mouth, the proportion of deaths attributed to these causes will appear very small, particularly when the additional danger of blood-poisoning, which division of the bone is supposed to offer, is taken into the account. Indeed, it is at first difficult to comprehend why there should be so great a difference in favour of resection of the lower as compared with the upper jaw. But I have no doubt the explanation lies in the fact that the removal of the lower jaw is practised through an exteral incision, with the head of the patient usually so placed that only a small quantity of blood finds its way into the air-passages, and a large part of the discharges after the operation drains away through the external wound.

It nevertheless appears quite possible to diminish the mortality still further by great attention to drainage from the outside, the application of iodoform powder or some equally good antiseptic in the inside of the mouth, and feeding through a tube during the first few days after the operation, when a very large tumour has been removed, or the patient has lost much blood or is unusually weak.

Cures due to Operation.—I have collected notes of nineteen cases of sub-periosteal sarcoma and of forty-three cases of central sarcoma, and the labour of collecting them has been tedious on account of the fact that I have not met with any larger collections of cases than those which I put together some years ago in *Sarcoma and Carcinoma*. The disproportion in the numbers of the tumours of central and sub-periosteal origin will at once strike the reader: it results from the fact that central tumours are really more numerous than sub-periosteal tumours of the lower jaw, not from mere chance in the collection. The great liability of the jaw to myeloid or giant-celled sarcoma alone accounts for the disproportion, for the number of these tumours as nearly as possible corresponds with the difference.

The nineteen cases of sub-periosteal sarcoma give the following results:—The operation of resection of the portion of the bone bearing the tumour was practised in every instance. There was no death from the operation. Eight of the patients were dead or dying of recurrence, and the recurrence was in almost every instance very rapid, so that not one of these patients was alive twelve months after the operation. One patient died of secondary disease in the mediastinal glands, the orbits, trunk, scalp, and interior of the abdomen at the end of four months and a half; but the account leaves it uncertain whether or not there was also local recurrence of the maxillary tumour. One died of pneumonia at the end of two months, but apparently without any local recurrence of the disease. Eight were lost sight of as soon as they left the care of the operating surgeon; and one patient was alive and well at the end of two years and a half after the operation. The results are certainly distressingly unsatisfactory. In the cases in which a microscopical examination was made, the tumours were nearly all round- or spindle-celled. The instance in which the operation was successful was that of a coloured boy, twelve years old, whose tumour—a round-celled sarcoma—was removed by Dr. Mears (Philadelphia). It grew from the body of the bone on the left side, and had already, at the end of three months, infiltrated the masseter muscle. There was no affection of the lymphatic glands. The disease was freely cut out with the surface of bone from which it grew, but I am not sure from the description whether the entire thickness of the bone was cut away or whether the operation was limited to the removal of the surface which bore the tumour. The boy made a good recovery, and was quite well at the end of two and a half years.

In three of the instances in which recurrence of the disease took place a second operation was performed, but in not one of the three was it attended with success, for a second recurrence appeared even more quickly than the first had done, and rapidly proved fatal.

The statistics of the central tumours offer an agreeable contrast to those of the sub-periosteal, although a very large mortality due to the operation must be deplored, and a large number of the patients were lost sight of after their recovery. Eight of the forty-three patients died of causes connected with the operation, in nearly every instance of exhaustion due to its severity and to the previous ill-condition of the patient. Two died of recurrence of the disease, and in one of these cases, recorded in Heath's *Diseases of the Jaws*, repeated attempts were made to remove the disease and the recurrent tumours. But finally the patient died, partly on account of the recurrent tumour, partly because secondary growths formed in the humerus and pelvis. In the other of these two cases, also taken from Mr. Heath's work, I am disposed to doubt whether the disease was really of central origin. The tumour was mixed-celled, grew from the body of the jaw of a little girl five years of age, had only been noticed two months when the first operation was performed, recurred very quickly after removal, was again removed and again recurred, and proved fatal within seven months of its first appearance. No examination of the body was made. Mr. Heath says the disease was clearly of central origin, but the description of the tumour and its relation to the bone does not give this impression, while the course of the disease was in the highest degree characteristic of sub-periosteal, not of central disease. No fewer than twenty of the forty-three patients were lost sight of after the operation; and thirteen patients were known to be alive and well at periods respectively of "some months" (two), five months, eight months, ten months, twelve months, seventeen months, two years, two years and a quarter, three years, three years and a quarter (two), and between five and six years.

There are therefore four instances in which the patients can be claimed, on the three-years' limit, to have been permanently relieved by operation, a proportion of as nearly as possible one in six when the cases which were lost sight of are left out of the consideration. In addition, several patients were quite well and free from disease at periods of from one to three years after the removal of the disease.

The study of the successful cases teaches that in the four wholly successful the tumour was in two of them giant-celled, in one spindle-celled (fibro-plastic), and in one a fibrifying sarcoma. In most of the cases which may be regarded as partially successful the disease was giant-celled (myeloid). There is not one instance in which an operation of less magnitude than resection of the portion of bone containing the tumour was wholly successful, but there is one in which a myeloid sarcoma was enucleated from the cavity in which it lay, and the patient was alive and well two years after the operation. There is also an instance in which mere removal of the tumour was followed by recurrence, the recurrent disease was resected, and the patient was well some months later. And there is still another in which a fibrifying spindle-celled sarcoma, containing calcareous particles, was shelled easily out of its cavity in the interior of the body of the jaw. It soon began slowly to form again, and at the end of seven years, when it was still of small size, the portion of the bone containing it was resected. I can give no further account of the case than that the patient made a good recovery from the second operation. It is, however, a case well worth bearing in mind, for the small size and structure of the tumour, together with the absence of any adhesion between it and the perfectly smooth-walled cavity in which it lay, gave every reason to hope that enucleation would suffice for the complete cure of the disease. But the recurrent tumour was intimately blended with the bone, and it would have been impossible to enucleate it even had the surgeon (Mr. Holden) been disposed to attempt it. In the most successful cases, the growth of the tumour had been observed for from eight to thirty months before an attempt was made to remove it; in other cases, particularly those in which the tumour was myeloid, the disease had existed for several years before an operation was performed: in one of these the patient was alive and free from disease a year and a half after the operation.

In several of the cases in which the patients were lost sight of, the operation was not the first to which they had been subjected. One example of such a kind has just been mentioned, and there are at least three others in which resection of the tumour and the bone in which it grew was followed by recurrence and by a second operation, but the later history of the patients is not recorded.

Are patients who are not cured, relieved by operation? To this, as a general proposition, the answer will certainly be, Yes. Provided there is no local recurrence of the disease, or during the interval between the operation and the recurrence *in sitû*, the patient, in the very large majority of instances, is decidedly relieved by the operation. Recurrent disease may, of course, produce the same or even greater discomfort than the original tumour. And if there is only a small prospect of so completely removing it as to ensure against immediate recurrence, it is scarcely reasonable to subject a patient to an operation in the least degree severe.

It is, moreover, necessary to consider the effect on the individual of the removal of a large fragment of the lower jaw. It may well be imagined that deformity may result from the loss of so important a part of the bony framework of the lower part of the face, and also that difficulty may ensue in the act of mastication. Fortunately, as Mr. Heath has pointed out, these troubles are far less felt than might have been believed on theory. Firm fibrous tissue takes the place of the bone which has been removed, and a plate of teeth can be so well fixed to this that the outline of the jaw is preserved. The muscles, too, become attached to the fibrous medium, so that the movements of the jaw can be perfectly performed. Some skill and, still more, patience on the part of the dental surgeon will generally suffice to make the patient not only quite comfortable, but perfectly presentable.

Conclusions.—For sub-periosteal sarcomas of the lower jaw, the only operative treatment which holds out any prospect of success is resection of the bone bearing the disease, with removal of the soft parts adjoining the tumour.

The prognosis is, in spite of early and free operation, very bad on account of the rapidity with which the disease involves the neighbouring structures and recurs after removal.

For central sarcomas, the operation most likely to be permanently successful is resection of the fragment of bone which contains the tumour.

The prognosis of such operations, when the patient has recovered from the operation itself, is not bad, especially when the tumour for which the resection is practised is a giant-celled or myeloid sarcoma.

But it appears quite justifiable, particularly when the tumour is myeloid, to attempt to remove it by enucleation. Even if recurrence takes place, provided the recurrent disease is treated at an early period by resection, the life of the patient is probably not imperilled by the failure of the previous operation.

Recurrent disease, both sub-periosteal and central, should be treated by free resection, unless it is so extensive or so situated that there is no reasonable prospect of completely removing it with safety to the patient.

CHAPTER XIII.

TONGUE.

The number of cases of sarcoma of the tongue on record is at present so small that it is not necessary to consider this disease from the operative point of view.

Only one variety of carcinoma appears to affect the tongue—the squamous-celled or epithelioma. It may occur on any part of the organ—tip, dorsum, borders, as far back as the epiglottis ; attacks men far more frequently than women ; is a disease of adult age, rarely appearing in persons under thirty years ; and commences now in the form of a wart, now in the form of a chronic ulcer, or a fissure, or a nodule. Ulceration takes place at an early period of the disease, whatever the form of outbreak, and the borders and base of the ulcer soon become indurated. Destruction of the substance of the tongue proceeds, and the induration deepens. Ere long the neighbouring glands become enlarged and hard, and at a later period adherent to the parts around them. As the disease advances, the floor of the mouth, the larynx, the palate, and tonsils are liable to be involved, and the gums and jaw are not infrequently affected. The tongue becomes fixed, and cannot be protruded, or even raised off the floor of the mouth. In the course of a year or a year and a half from the first development of the essential characters of carcinoma the patient usually sinks and dies, worn out by hæmorrhage, profuse discharge, pain, salivation, difficulty of taking food, and ulceration of the lymphatic glands. After death it is comparatively rare to find secondary growths, but they occasionally occur in the lungs, the liver, and other organs and tissues.

Removal of the primary disease may be followed by local recurrence, and the recurrence may again take place after a second operation in the same manner ; or, without local recurrence, the glands may become affected, and by their enlargement and ulceration may prove fatal.

It is very important to bear in mind, not only for the purpose of more certain diagnosis, but in the prophylactic treatment, that carcinoma of the tongue is, in a large number of instances, preceded by some chronic affection of the surface of the tongue, chronic superficial glossitis, or one of the several conditions which are due to it, such as ichthyosis, psoriasis, leucoma.

Methods of Operation.—In a work recently published (*Diseases of the Tongue*, 1885) I have described at length what I believe to be the best methods of removing the tongue, either in part or whole, and may refer the reader to those descriptions for the minuter details.

I may say first that caustics are rarely, if ever, employed for actually developed cancer of the tongue, although the acid nitrate of mercury and nitric acid are occasionally used for the destruction of warts, ulcers, and fissures which do not appear to be yet cancerous, but which bid fair to become cancerous if they are not treated energetically. Of course such conditions as these may be removed with the knife or scissors, and personally I very much prefer this method of dealing with them.

In all the larger operations on the tongue, an anæsthetic should be administered, the mouth should be thoroughly opened by means of a strong gag, the tongue should be drawn well forwards by threads introduced through the tip, and the best possible light should be obtained. On the side opposite to that on which the gag is placed, a large plated or copper retractor should be used to hold back the cheek. With such an excellent exposure, and such a command over the tongue, there is little difficulty or danger in removing half or the whole of the tip. The mucous membrane is divided in the middle line on both the dorsal and under aspects of the organ, and the two halves can then be easily separated with the fingers—in fact, torn apart. Each half may be removed with knife, scissors, écraseur, or galvano-cautery, according to the inclination of the operator and the means at his disposal. I much prefer the knife or scissors to the écraseur and galvano-cautery in the removal of the fore part of the tongue. If the incision is made from below upwards, the artery will be divided early, and may at once be tied or clamped, after which there will be no bleeding of consequence.

Removal of half or the whole of the tongue may be performed with the instruments I have named. The operation with scissors by Whitehead's method has been practised very frequently of late, not only by Mr. Whitehead himself, but by many surgeons in

London and the large provincial towns. I have performed it several times within the last few months, and can speak favourably of it both on account of the celerity with which it can be completed, and because I believe it to be a safe operation, provided it is carried out in the manner described by Whitehead. This is as follows:—The mouth is opened to the full extent with a gag, the duty of attending to this important part of the operation being entrusted to one of the two assistants required. The tongue is drawn out of the mouth by a double ligature passed through its substance an inch from the tip. This ligature is given in charge of the second assistant, with instructions to maintain throughout the operation a steady traction outwards and upwards.

The operator commences by dividing all the attachments of the tongue to the jaw and to the pillars of the fauces, after the manner suggested by Sir James Paget, with an ordinary pair of straight scissors.

The muscles attached to the base of the tongue are then cut across by a series of successive short snips of the scissors until the entire tongue is separated on the plane of the inferior border of the lower jaw, and as far back as the safety of the epiglottis will allow.

The lingual or any other arteries requiring torsion are twisted as divided. It is generally found that a moment's pressure with a small piece of sponge, held in sponge-forceps, suffices temporarily, if not permanently, to arrest any bleeding; it is, however, regarded as desirable to twist, either immediately or after the tongue is removed, every bleeding vessel.

A single loop of silk is passed by a long needle through the remains of the glosso-epiglottidean fold of mucous membrane, as a means of drawing forward the floor of the mouth should secondary hæmorrhage take place. This ligature may with safety be removed the day after the operation, and, as it is a source of annoyance to the patient, it is always desirable to adopt this rule.

Instead of the scissors, the écraseur may be employed, after Morrant Baker's method. The mouth is opened and the tongue is drawn forward in the manner which has just been described. The tongue is then split down the middle. The diseased half, or one half if both sides are affected, is drawn far out by tightening the thread attached to it, and the operator, with a pair of blunt-pointed scissors, snips the mucous membrane and muscles between the jaw and tongue as far back as may be necessary, "running" the scissors along the floor of the mouth and very close to the jaw.

Then, with his forefinger and occasional snips of the scissors, he frees the tongue as completely as may be requisite from its attachments. When the half of the tongue is freed up to and well beyond the line of the disease, one or two blunt curved needles are made to perforate it an inch or more, if possible, behind the cancer, and the loop of the écraseur is slipped over it and adjusted behind the needles. The écraseur is now screwed up, and, especially when whipcord is used, a long whitish cord is left in the loop of the whipcord. This cord should be carefully ligatured on the side next the stump of the tongue, for it contains almost always the lingual artery and vein.

If both halves of the tongue require removal, the second half is treated in the same manner as the first.

The galvano-cautery may be employed in the manner described by Bryant, who recommends for the purpose a Bunsen's battery and Middeldorpf's instruments. The part to be removed is first isolated by the introduction of long pins, ivory pegs, or curved needles in handles beneath the base of the growth. The tongue is then drawn forward and the mouth kept widely open in the manner which has been described, and the loop of the galvanic écraseur is passed round the base of the disease and gradually tightened behind the pins, the connection between the poles of the battery being made as soon as the wire loop has been adjusted, but not before. The process of tightening and cauterizing may then be carried out; and, when performed successfully, the part to be removed will quickly fall off without the loss of a drop of blood. In this process of tightening and cauterizing much care is called for. In the first place, the wire that is employed should be thick or twisted. Mr. Bryant thinks the twisted platinum wire is better than the thick. The wire should not be heated beyond a red heat, and the redness ought to be of a dull kind. But, above all, the process of tightening should be very slowly performed, the wire of the écraseur being screwed home only as it becomes loose by cutting through the tissues; force may break it and thus give rise to difficulties, or make it cut through the tissues too rapidly and give rise to bleeding. Whenever bleeding follows the operation, it is from one of two things: the wire cautery has been used at too great a temperature, or has been screwed up too rapidly.

Better batteries than Bunsen's may now be obtained for this operation; for example, a powerful bichromate battery, the force of which is regulated by raising or lowering the lid of the box in which it is contained.

After the completion of the operation, by whatever means it has been accomplished, the surface of the wound is carefully examined to see if there be any bleeding vessels, and these are taken up and tied. Iodoform powder is then dusted over the whole surface, and the patient is put back into bed. If the whole of the tongue has been removed, it is always well to insert a thread into the remains of the glosso-epiglottidean fold, where it should remain for four and twenty hours to enable the stump to be drawn forward if it should sink back into the throat and so threaten suffocation. The wound is dusted over from time to time with iodoform powder or plugged with long narrow strips of iodoform gauze, and the patient is fed two or three times a day, according to his condition, through a tube by means of a funnel or a syringe to ensure his taking a sufficient quantity of nourishment, and for the better keeping of the stump at rest. In the course of ten days or a fortnight, in the majority of instances, unless the patient is very old or feeble, convalescence is established, although the wound may take four or five or more weeks to heal completely over. It is well to maintain the artificial feeding, either in whole or part, for at least five or six days after the removal of the tongue.

In order to gain more space for the performance of the foregoing operations, the cheek may be divided horizontally by an incision extending from the angle of the mouth to the anterior border of the masseter muscle. This affords ample space, and is particularly useful in cases in which the disease is not limited to the tongue, but affects the floor of the mouth or extends to the jaw, or in cases in which it is of large extent, and is seated at the posterior part of the organ.

When the glands are affected they are usually removed if the case is considered suitable for operation at the time of the removal of the tongue, and, for my own part, I may say that I make the removal of the glands first and that of the tongue second, for the patient is in a better condition for the dissection of the glands before than after the severer operation within the mouth.

It is possible to combine the removal of the glands with that of the tongue by means of Kocher's or the Billroth-Regnoli operation, the incision in the one case running along the side of the neck and floor of the mouth, in the other case running parallel with and just behind the line of the lower jaw. In each case the lingual artery is ligatured before the tongue is removed, and in the Billroth operation, not one, but both, the arteries are ligatured. The remainder of the operation, so far as the removal of the tongue is concerned, is thus rendered bloodless and very easy to perform.

Kocher's operation is not limited merely to a certain line of incision, to ligature of the lingual artery, and to the removal of the glands as well as the tongue. The external wound is dressed according to the Listerian method, and the cavity of the mouth is plugged with antiseptic gauze; the patient breathes through a tracheotomy cannula, for tracheotomy is performed immediately before the removal of the tongue, and the feeding is accomplished through a tube twice a day when the dressings within the mouth are changed. I shall speak of Kocher's results presently, but may now say that a preliminary tracheotomy is, if possible, to be avoided; and that, since the introduction of the use of iodoform and regular feeding, the results of operations for the removal of the tongue have so much improved that the Listerian antiseptic method may be dispensed with.

In those cases in which the disease within the mouth has extended to the gums and jaw, it may be needful to resect a portion of the bone. This adds undoubtedly to the severity and danger of the operation, and should only be undertaken when it is absolutely necessary. In some instances it suffices to remove the affected soft parts off the bone, and to scrape the surface of the jaw, or burn it with the thermo-cautery. Recurrence takes place, not in the bone, but in the soft parts covering the bone, in the vast majority of cases. I do not think it is ever necessary to divide the jaw merely for the removal of the tongue, however far backwards the disease extends. Good gags, good light, thorough command of the tongue, and the horizontal incision through the cheek amply suffice for the removal of the entire tongue as far back as the epiglottis, and for most operations for the removal of disease affecting the floor of the mouth.

It is not at all unusual for enlargement of the glands in the floor of the mouth and behind the jaw to take place after the removal of the tongue. That they were actually affected before the operation there can be little doubt, but they were at that time so slightly enlarged that the fact of their enlargement was overlooked or could not by any means have been ascertained. When the glands cannot be felt behind the jaw or anywhere in the floor of the mouth, and when the examination has been conducted with one finger in the mouth, the fingers of the other hand externally, and the patient under the influence of an anæsthetic, it is only fair to assume that there is no affection of them. As soon as glandular enlargement appears, the diseased and all other glands which can be discovered in their neighbourhood may be removed, and the wound may be dressed according to the habit and judgment of the operator. I am not myself in favour of operations in search of glands in cases in which they cannot be felt to be enlarged by such careful examination as has been described, and the reasons I should give against these exploratory operations are the same as I have given against similar operations in the chapters on the Breast and Penis.

It may be well to state that, in cases in which there is extensive disease of the tongue, and (owing to lack of the teeth) difficulty in opening the mouth as widely as is desired, and where the patient takes the anæsthetic badly, and there is a necessity to spare blood, it is a good practice to ligature one or both lingual arteries before proceeding to the removal of the tongue. This practice is much more common among the surgeons of the German school than in this country, where I do not think it is performed as frequently as it should be. Quite lately I have had occasion to assist one of my colleagues in the removal of a badly diseased tongue in a bad subject, when some of the conditions of the operation were such as I have described. We ligatured both the lingual arteries, when the operation in the interior of the mouth was transformed from a particularly difficult to a simple and easy proceeding.

One thing I must not forget, namely, to draw attention to the excellent suggestion by Mr. Christopher Heath for drawing forward and controlling the bleeding stump of a tongue. It is that the stump can be brought forward by hooking the finger round the base of the tongue in the pharynx. Not only is the stump thoroughly secured and brought forward by this manœuvre, but hæmorrhage ceases at once owing to the firm pressure maintained by the finger.

Results of Operations.—*Mortality due to Operation.*—In estimating the mortality due to operations for the removal of cancer of the tongue, there are certain difficulties which are hard to meet. In the first place, it is exceedingly difficult to make allowance for the relative severity of operations which comprise the removal of a large part of the tongue or the whole tongue, and those which are limited to the removal of a comparatively small portion—a little less than one half, for example—and to estimate exactly the relative severity of operations which include the removal of the lymphatic glands and a large part of the tongue, and those which are limited to the interior of the mouth, but include the division of the lower jaw or the removal of part of the jaw and other structures within the mouth. In the second place, it is necessary to be thoroughly alive to the fact that the operation of removal of the tongue, whether it be limited to the removal of part or the whole of the organ, or include surrounding structures and the dissection of the glands, is a much less dangerous operation now than it was. The improvements which have been made in the AFTER-TREATMENT of the patients during the last five years have done more to lessen the dangers of the operation than all the modifications in the procedure itself which have been introduced in the last fifty years. And I am convinced that, in the immediate future, the success of the operation of removal of the tongue will depend far more on the manner of treating the patient after the operation than on the method of performing the operation itself. I have stated this opinion elsewhere, and I repeat it now, for it is a conviction which the experience of every year confirms. With regard to the first difficulty, I quite agree with Barker (Holmes's *System*, vol. ii., third edition) that it serves no good purpose, in the consideration of the mortality due to operation, to attempt to divide all the various methods of operating and then to work out their mortality. When the causes of death are considered, the reason for this position will be seen in the fact that the vast majority of the fatalities were due to one of two causes, no matter whether the operation was large or small.

Barker, taking certain series of cases of operations performed either in University College Hospital or by German and English surgeons, found that the mortality in 218 persons (on some of whom more than one operation was performed) was nearly 17 per cent. I believe these series do not include those cases in which there was merely secondary removal of the lymphatic glands, but only those in which there was an operation on the tongue itself.

In my own table of eighty cases (*Sarcoma and Carcinoma*) only seventy of the patients were submitted to operation, with a total mortality of eight, and a percentage mortality, therefore, of 11.42. My statistics were taken from various sources, and certainly include some of the cases in Barker's tables, so that the two sets of statistics overlap to a small extent. And both Barker's and my table contain many cases belonging to a tolerably early period of lingual surgery. I do not know why the mortality in his 218 cases should be so much greater than that in my seventy cases, unless it be that a much larger proportion of my cases are comprised of operations performed within the last few years. One thing is quite clear, namely, that the mortality due to removal of the tongue has largely diminished during the last few years.

In order to exhibit this improvement, we may examine several series of cases with advantage. In my recent work on *Diseases of the Tongue*, the following numbers are given:—Whitehead gives a list of fifty-eight persons for whom the "entire" tongue was removed either by himself or other surgeons, and in forty-eight of these the operation was performed with scissors. Nine deaths were due to the operation, so that the mortality is between 15 and 16 per cent. This large mortality may be explained by observing that the operations are many of them of the date of some years back, before the best methods of after-treatment were adopted; further, that they were in every case of considerable magnitude; and still further, that the reputation of an operator for a certain operation leads in the course of time to the drifting to him of cases of the worst description, in which the disease is extensive and the patient in a bad condition to bear a large operation.

Morrant Baker removed half or the whole of the tongue (with the écraseur) forty times, and the total mortality due to the operation was five. But death occurred in one of the five cases from diphtheria, which must be regarded as an unlooked-for accident, and one which need not be taken into account in estimating the risks of the operation. Certainly, on the other hand, it may be said that, had the operation not been performed, the patient might have escaped the diphtheria, or, if he contracted it, might not have died of it. But my own feeling would be that this death should not be counted in estimating the percentage of mortality in this series of cases.

To show the effects of careful management of the wound and of the patient after the operation, I take the statistics of Kocher and Woelfler. Kocher's operation, performed from the outside and comprising a preliminary tracheotomy and thorough antiseptic dressing of the wound, together with regular feeding of the patient, has been already alluded to. It is the only operation, so far as I am aware, in which there has been a successful attempt to carry out the Listerian dressing in every detail. Kocher performed this operation on fourteen patients, and only one of the fourteen died of the effects of the treatment. The total mortality is therefore just over 7 per cent.—a very small mortality when the magnitude of the proceeding is taken into the account. But the total number of cases is too small to allow large deductions to be drawn from this method of treatment.

Woelfler publishes several interesting series of cases from Billroth's wards. They must be regarded as experimental, for the intention was to try to improve the results of operations for the removal of the tongue, and to determine, as far as possible, the effect of variations of treatment on the results. A method of cauterization of the wound with permanganate of potash, and of drainage through the floor of the mouth, was adopted, and eighteen patients were treated by this method. Of these, two died. (The method, and also the later method of treatment by plugging with antiseptic gauze, will be found fully described in the twentieth chapter of my book. I have not repeated the descriptions here, because the cauterization method has been given up by the Billroth clinic, and the plugging with gauze is scarcely necessary now that the wound is dusted over with iodoform and the patient is regularly fed.) Then, thirteen patients were treated without cauterization and without drainage, and, of these, two died. Nine patients were treated without cauterization, but with drainage, and two died. And, lastly, six patients were treated with cauterization, but without drainage, and two died.

But it is not merely the number and percentage of deaths in these series with which we have to do. It is quite as much, nay more, with the causes of death. In no fewer than thirty of the fifty fatal cases in Barker's tables, the cause of death was affection of the lungs, bronchitis, pneumonia, broncho-pneumonia, gangrene of the lung, abscess in the lung, &c. And in nearly all these cases the pulmonary affection was of a distinctly septic type. Ten of the patients died of septicæmia or pyæmia, and there is little doubt that in some of these cases also the lungs were affected. The remaining ten patients died of such causes as might prove fatal after any severe operation on any other part of the body—collapse, shock, erysipelas, fatty heart, &c.—with the exception of one who died of œdema glottidis, and one who perished from falling back of the stump of the tongue and consequent suffocation. Again, of the eight fatal cases in my own tables, the cause of death in five was pneumonia or some affection of the lungs. Five of the nine fatal cases in Whitehead's table were from septic pneumonia, and one from an abscess bursting into the bronchial tubes. And three of the four or five deaths in Baker's series were attributed to septicæmia or septic pneumonia.

It is curious how, in the gradual improvement which has taken place in the statistics of operations during the last fifteen years, surgeons of all countries appear to have accepted with resignation the large mortality following removal of the tongue as if it had been an inevitable evil. The operation has been regarded as a far graver proceeding in certain respects than it really is. An operation which is very seldom fatal from primary or secondary hæmorrhage, and comparatively rarely fatal from shock, cannot be regarded as a very severe surgical operation. And this is the fact with regard to operations for the removal of the tongue. There was not one of the deaths in Barker's table credited to hæmorrhage, and only one of the patients in my own series died from this cause. Whitehead distinctly states that he cannot remember any patient having died from the immediate effects of losing blood, and the same may be said of Baker's patients. Not one of the patients in my own table, and only four in Barker's table of 218 cases, died of shock or collapse. Only one of the ninety-eight patients treated by Whitehead and Baker died of syncope or shock. The few deaths which were due to exhaustion a few days after the operation may be regarded as due to a cause which is now to a large extent avoidable, owing to the better means at our disposal of maintaining the strength of our patients.

But within the last five years attention has been especially directed to the causes of death after the removal of the tongue, and it is to the great credit of the German and Swiss surgeons that the attention they have devoted to the subject has at length resulted in far better management of patients after operation, and consequently in far greater success. The energy which was formerly directed to improvements in the manner of performing the operation itself is now directed to improving the after-treatment of the patients, and the result is seen in a very much lower rate of mortality. Kocher's antiseptic method has, in his hands, resulted in the recovery of thirteen of the fourteen patients on whom he operated, and the fatal case was not due either to blood-poisoning or to any affection of the lungs. I have given the number of deaths in the successive series of cases treated in Billroth's clinic and reported by Woelfler, and now let me give the causes of death in each series. Of the two patients who died after thorough drainage and cauterization, one died of collapse, the other of some unascertained cause—apparently exhaustion. Examination of his body after death discovered no lesions which could be attributed to pulmonary or general sepsis. The remaining six patients, who were either treated without drainage and cauterization, or with one and not the other of the two, died of septic poisoning, either pulmonary or general. Then came the last series, in which the wound was treated by iodoform gauze packing, and seventeen patients were subjected to operation, in some instances to severe operation, without a single death. One of the chief reasons for adopting this method of dressing was the increasing reputation of iodoform as a dressing for wounds; another was, that the cauterization was painful, and was obliged to be carried out while the patient was still under the influence of anæsthetic. It is to be noted that no system of drainage was found necessary in this series of cases—a great advantage, when the method which had been employed in the preceding series, and the difficulty of maintaining it, are taken into account.

For my own part, I may say that I have only employed the method of "packing with iodoform gauze," recommended by Woelfler, in one instance. Partly because the case ended fatally, and I was disappointed on finding that the patient died of septic pneumonia in spite of the apparent success of the operation and the perfection of the dressing, but still more because I have every reason to be satisfied with the success of the dressings and management I have adopted in later cases, I have not cared to use the "packing" again. The careful dusting of the wound with iodoform from time to time, and the regular feeding of the patient during the first days after the operation, have been most successful in my hands.

With regard to the effect of the method of operating on the results of operations, I am afraid I am not in a position to offer very reliable information. The statistics of Whitehead and Baker have been already discussed. The Listerian method in the hands of Kocher has been similarly discussed, but the number of cases is very small. The series of cases recorded by Woelfler contain operations performed in different ways, and of very varying extent. And I have not met with any series of operations in which the tongue was removed with the galvano-cautery. Baker's method has been employed by my colleagues and myself more frequently than any other at St. Bartholomew's Hospital; but within the last two years we have removed the tongue in many instances with the scissors by Whitehead's method, and the operation has, I think, been generally approved. Speaking for myself, the small loss of blood during the operation, the celerity with which it can be performed, and the much greater ease with which the incisions can be directed so as to thoroughly clear the disease than when the cold or heated loop is used are very satisfactory. But I venture to recommend that Wells's clamp-forceps should be used for the immediate arrest of hæmorrhage, and that the vessels should be tied rather than twisted. If the clamp-forceps are employed, they may be adjusted so as to clamp the main artery before it is cut through, provided very short snips are made with the scissors and the structure of the tissues is frequently examined.

Mr. C. B. Lockwood has shown me a clamp for compressing the lingual artery before the commencement of the operation, so as to render the proceeding practically bloodless; but I have not yet had an opportunity of employing it.

Cures due to Operation.—For the study of this portion of the subject I shall take Barker's numbers and those in my tables in *Sarcoma and Carcinoma.* The series overlap each other very slightly; the one is comprised of cases in many of which there was no microscopical examination of the disease, the other of cases every one of which was confirmed by microscopical examination. Barker's statistics include the well-known series of Billroth, Kocher, and Rose. Of 170 patients, Barker finds seventeen were alive and free from disease at the end of at least a year after the last operation. The longest duration of life in any instance was ten years. In my book on *Diseases of the Tongue*, p. 295, I have given an account of the good health of nine of the patients in the original table at least a year after the last operation. Since the date of writing that page, I have still further amended the table by searching out some of the patients, and I shall venture to consider the whole question in a somewhat different light, to bring it into harmony with the other parts of the present essay.

In the first place, the limit of time which both Mr. Barker and I accepted was one year, whereas the "three-years' limit" has been generally adopted throughout the pages of this book. That this alteration will seriously affect the percentage of "cures" there can be no doubt, but a one-year limit is rather too short to allow of a fair prospect being held out of complete cure. Taking the three years' limit, Barker's seventeen successful cases are reduced to eight, so that the percentage is reduced from ten to less than five on 170 cases. I do not, however, think he has taken into account the cases in which the patients were lost sight of after the operation. All these cases ought to be deducted. If they are not deducted, it is assumed that, had the patients been kept under observation, they would have died of the disease. I am led to this conclusion by the last sentence but one in the paragraph on "Frequency of Recurrence" in Barker's paper, in which he says: "Others, of course, may have recovered and been lost sight of; but it is always usual for the successful cases to come to the surface" (p. 605). Let me say at once that I do not at all agree with Mr. Barker on this matter. It is wholly unfair to assume that all the patients who are subjected to operation for malignant disease, and who are lost sight of after the operation, die of a return of the disease, or of affection of the glands or of other parts of the body. It would be much more fair to argue in the contrary direction; it is the unsuccessful cases which return, because the operation has been unsuccessful, and the patients are driven to seek further relief; those who have no return of their disease are lost sight of and must be searched for. In hospital practice this is particularly true; the patients who are cured by operation have not the time, even if they have the inclination, to return after long intervals to show that the cure is maintained, and our best chance of seeing them is when they are driven again to the hospital by some other malady. Of course I have no intention of claiming all the lost cases as cures because they have been lost sight of, and only ask that they should be left out of the consideration. If this is done, the percentage of cures in Barker's series will probably be much improved.

The amended figures in my tables read as follows:—Seventy patients were treated by operation, and of these, eight died of the operation itself. Nineteen were lost sight of after the operation; thirty-two were dead or dying of recurrence or glandular disease; one died of another disease four years after the removal of the epithelioma, and may therefore be counted as a cured patient so far as the epithelioma is concerned; ten were alive and well at periods of from a few months to eleven years after the operation; but the duration was a full three years in only five of them. There are thus six cases of cure on the three-years' limit in seventy cases of operation—a percentage of just over 8.5. Unfortunately, the number of cases in my table is not nearly so large as that from which Mr. Barker has drawn his statistics, but the quality is better, for the disease was microscopically examined in every instance.

With regard to the character of the successful cases, I can only speak of those in my own table, and the fact is significant that in only one instance was there any affection of the lymphatic glands, either at the time of the operation or afterwards. In that one instance the glands were removed at the same time as the primary disease. I am not, of course, referring to those cases in which there was glandular enlargement at the time of the operation, which subsided after the removal of the primary disease. Again, it is significant that the cured cases do not include any case in which a second operation was performed (for recurrence in the tongue). I must once more admit that the total number of cases is far too small to allow of large deductions. A further search at the present time would, I have no doubt, discover here and there an instance of very successful operation for recurrent disease. And even the partial success which is exhibited by such operations in some of the cases is thoroughly worth the risk which has been run in the operation itself.

The absence of glandular affection in almost all the successful cases must not be passed over without further consideration, for it has an important influence on the question of the kind and extent of operation which should be generally recommended and practised. The absence of glandular affection in successful cases corresponds with what is found in operations for malignant disease in all other parts of the body. The chapters on the Breast, the Vulva, Penis, Lower Lip, and other parts, all show that this is true. And the evidence all points to the fact that large and sweeping operations, which include not merely the free removal of the primary disease, but the dissection of the glands, are successful, not because they are large and remove the glands, but because they were practised in favourable cases. If the glands are enlarged and freely movable, and well within the reach of removal, the sooner they are removed the better, whether the enlargement accompanies the primary disease or occurs after its removal. But I am strongly opposed, on the same grounds which have been adduced in the chapters mentioned above, to operations for the search and removal of glands which cannot be felt through the external textures. On this account I would not practice Kocher's operation in cases in which the disease of the tongue is clearly accessible through the mouth, and there is no obvious enlargement of the glands. I express this opinion the more strongly, because I find that Barker is inclined to recommend extensive operations, and particularly speaks well of Kocher's operation, because Kocher can claim the largest percentage of permanent recoveries on the total of his operations (four out of fourteen on the one-year limit, three out of fourteen on the three-years' limit). But the number of cases (fourteen) is not nearly large enough to allow of such an important deduction. My own tables exhibit a series of cases far more successful than those of Kocher, although most of the operations were performed many years ago, and there was not a single instance, so far as I am aware, of primary removal of the glands. It is the series of cases numbered 32 to 41 inclusive, ten in number, but in two of them no operation was performed. All the patients were under the care of, and treated by, Sir James Paget, who kindly gave me his manuscript notes of each case. Of the eight patients who were treated by operation, one died of the effects of the removal of his tongue (cellulitis); three died of recurrence of the disease, with or without glandular affection; one died of affection of the glands, without local recurrence; and three were alive and well at periods respectively of three and a half, six, and more than six years after the operation. In the table the duration of life in the last of these cases is stated as three years and a half; but information has been since received which shows that the life of this patient has been prolonged up to the present date, a period therefore of nearly ten years since the removal of the tongue. There was not any affection of the glands, and therefore no removal of the glands, in any of these three cases. The truth is, these were favourable cases for operation, and were treated while there was yet time to treat them successfully. And this circumstance, not the nature of the operation or dissecting out the glands before they could be felt, accounts for the percentage of more than 37.00 thoroughly successful cases.

There is one point in connection with successful operations to which very little attention has been directed, but which deserves much more attention in the immediate future. Every surgeon is agreed that when the disease is seated far back on the border or side of the tongue, or in the centre of the organ, the prospect of success from an operation is very small. But there is singularly little evidence to show how far the results of operation are influenced when the disease is seated in the fore part of the tongue or at its tip. Such cases ought to afford the best results when the operation is performed at an early period of the disease, and I have no doubt they do so; but there are few facts as yet to prove it.

Of the duration of the disease at the time at which it was removed, it can only be said that, although the cancer was removed very shortly after its appearance in one or two instances, this was by no means invariably the case. In other instances, six or nine months had been allowed to elapse before the operation was performed. The successful issue of these cases accords with what has been observed in cancerous affections of other parts. It merely tends to prove that they were particularly suited for operation: the disease had existed for a period which is considered long in cases of malignant disease of the tongue, yet it was still of small extent, and had not involved the neighbouring structures or the lymphatic glands. And the result cannot be used to uphold in the smallest degree the argument in favour of deferred operation, for if the operation had been performed at an earlier date in each of the successful cases, each would have been less severe and equally successful.

Are patients who are not cured, relieved by operation? To this question the answer undoubtedly is: "Yes, provided the operation has been successful in so completely removing the disease of the tongue that there is no recurrence within the mouth." The glands may become enlarged, and from the floor of the mouth the neck as far down as the sternum and the clavicles may be occupied by them; they may break down, and horrible ulceration may ensue; and death may be painful and distressing. But, however hard death from this cause is, death due to disease within the mouth itself is far harder to bear.

Pain, salivation, difficulty of speech and swallowing, with attacks of dyspnœa, difficulty in preventing fœtor, hæmorrhage—all combine to produce as terrible a death as any produced by cancer. Certainly much more can be done now than even a few years ago to relieve patients suffering from fatal cancer of the tongue; but no means are so good as those which consist in such complete removal of the primary disease that there shall be no local recurrence. Naturally, those cases are the most favourable for this treatment in which the disease is seated far forward in the tongue; and in such cases I have not hesitated to remove the primary disease when there was so extensive and adherent affection of the glands that it was impossible to remove them. On the other hand, I do not approve of futile attempts to remove extensive disease seated far back in the mouth, when the tongue is adherent, and the surrounding structures are involved. The recurrence is so speedy and the relief so short that the deferment of death for a few weeks is not worth the risk, distress, and anxiety of a severe operation.

Conclusions.—Malignant disease of the tongue should be removed when it is so seated that it can be thoroughly taken away, and the patient is a fit subject for operation.

The operation may be performed through the mouth in the large majority of instances.

When the disease affects the floor of the mouth, or there is affection of the glands, an external operation is usually advisable.

So far as the mortality due to the operation is concerned, the manner of operating is of less importance than the after-treatment of the patient.

Recurrent disease of the tongue should be removed if it is accessible.

The prognosis in cases of recurrent disease is far less favourable than the prognosis after the removal of primary disease.

Enlarged glands should be removed if they can be completely dissected out, and the operation should be performed at the earliest possible date; but the prognosis is very unfavourable.

The primary disease may be removed by operation in cases in which there is such affection of the glands that they cannot be removed, provided the removal of the primary disease is likely to be so thorough that there shall be no recurrence within the mouth.

And, last, I would urge that ulcers, warts, nodules, fissures, and all pre-cancerous conditions of a similar kind, should be removed in persons over thirty years of age, if they do not yield to treatment. They may not be cancerous at the time of their removal—so much the better; but if they are left, and particularly if they are irritated by natural or artificial causes, they will certainly become cancerous. During the last two or three years I have had many opportunities of putting this precaution into practice, and the results have been thoroughly satisfactory.

CHAPTER XIV.

PALATE.

PRIMARY malignant disease of the palate, whether of the hard or soft palate, is very rare. I can scarcely recall a single case of the disease in the last fifteen years, during which I have been actively engaged in the wards of St. Bartholomew's Hospital, although I can recall several cases of innocent tumour of the palate, and many instances in which either the soft or hard palate has become involved in malignant disease which had commenced in neighbouring structures. The best general account of the tumours of the palate, and the most complete collection of cases, will be found in the *St. Bartholomew's Hospital Reports* (1886, xxii. 315), by Mr. Stephen Paget. He has there tabulated twelve cases of sarcoma and three of carcinoma, which were all the cases of malignant disease which he was able to collect from every source. It is scarcely possible to do more than hint at the course and treatment of these diseases from so small a quantity of material, and I shall therefore endeavour to indicate rather than dictate in the following paragraphs.

Sarcoma of the palate appears to be a disease chiefly of persons of adult age, and to attack both men and women in tolerably equal numbers. The variety of the disease which has been commonly observed is the round-celled. The slow growth of the tumour in some of the recorded instances, and the long duration of the disease, leads one to suspect that the tumour was in its origin not sarcomatous, but perhaps fibrous, and that it had become sarcomatous at a late period of its existence. Even if this be admitted, the sarcomas of the palate have been for the most part tumours of slow growth and progress, not tending to affect the lymphatic glands, apparently not speedily recurring after removal, and not exhibiting an inclination to affect the internal organs or distant tissues. One or two instances of melanotic sarcoma have been recorded, which have led Mr. Paget to question whether this pigmentation may not be a reversion to the pigmentation of the palates of animals. The origin of the twelve sarcomatous tumours collected by Mr. Paget was not by any means the same in every instance: not only did some of them arise from the soft, some from the hard palate; but the particular structure of the palate from which they arose was not in every case the same. I have shown in this essay and elsewhere (*Malignant Disease of the Larynx*, p. 4) how largely the origin of a malignant tumour may influence its course, and I have no doubt that a great difference would be found in the relative malignancy of palate tumours, according as they take their origin from the soft structures of the palate, or from beneath the periosteum, or from the interior of the bone, if a sufficient number of cases could be compared. At present, however, this can only be inferred, and need not influence our action in regard to the disease.

Carcinoma of the palate, if the few recorded instances afford a fair indication of the characters and capacity of the disease, is a much more malignant affection than sarcoma. It grows quickly, affects the glands at the angle of the jaw and in the neck, produces secondary tumours of the lungs and other organs, and proves fatal at an early period. The reported cases appear to have been examples of spheroidal-celled carcinoma (medullary or glandular cancer), but there is no reason to believe that the palate may not also be the seat of primary squamous-celled carcinoma (epithelioma). In the three cases collected by Mr. Paget the disease attacked persons between fifty and sixty years of age, two of whom were men. In the men the disease affected the soft palate; in the woman it involved both the hard and soft palates; but it does not appear in which of them it took its origin.

Methods of Operation.—The great difference in the situation, relations, and extent of the disease renders it impossible to do more than suggest the lines of operative treatment which may with advantage be pursued.

Treatment with Caustics.—Mr. Paget states that the uselessness of caustics is shown in one of the cases in his table. I cannot discover that they were employed in this case in such a manner as to offer a reasonable prospect of success. But I should quite agree with Mr. Paget that the palate is not a region to which caustics can be applied readily and for a sufficiently long time, and that they are not at all likely to find acceptance in the treatment of malignant tumours of the palate.

Removal of the Disease.—The mouth should be widely opened by means of a strong gag, the cheek on the side opposite to the gag drawn back with a copper or plated retractor, the head thrown back, and the patient placed opposite the best light which can be procured. An anæsthetic should be administered, and chloroform is to be preferred, on account of the greater ease with which the anæsthesia can be maintained. Ether is inapplicable in those cases in which a cautery is used, and is objectionable on account of the congestion of the head and face, and the salivation which it induces. The extent and attachments of the tumour can now be ascertained with much greater precision than by an ordinary examination without anæsthesia. In some cases it will be found possible to enucleate it through a simple longitudinal incision, without any further dissection; but in the majority of instances it will be found necessary to dissect or cut away the disease, together with the structures in the midst of which it grows. The operation may be performed with the knife, bone-forceps, bone-scissors, raspatory and gouge. Some of the steps may best be performed with the thermo- or galvano-cautery, on account of the effect which these instruments exercise on the bleeding vessels, and also because they destroy to a greater or less depth the apparently healthy tissues in the vicinity of the disease. After the removal of the tumour the bleeding vessels may be secured with ligatures, or nipped with clamp-forceps; or, if they are so placed that they cannot be seized, they may be treated with the cautery or by pressure. There are no larger vessels in the palate than the posterior palatine; and although this is not always easy to secure, the hæmorrhage from it can certainly be arrested by means of cautery or pressure. And, if the vessel is divided at any point in front of the palatine canal, the hæmorrhage may be arrested by plugging the posterior palatine canal, which lies on the inner side of the last molar tooth, about one-third of an inch in front of the hamular process. The wound may be dusted with iodoform or packed with iodoform gauze, and the patient may be fed, if needful, during the first few days, through a tube. In cases in which the tumour has been of small size, and the patient has not suffered a severe operation, recovery will take place rapidly and without the necessity of artificial feeding.

Three questions must be raised in connection with the manner of operating.

First, whether it is desirable to divide the cheek in order more thoroughly to expose and deal with the tumour? The answer depends on the situation and extent of the disease. If the patient is feeble, and the disease is so situated that there may be difficulty in reaching it and in controlling the hæmorrhage, there is no reason why the cheek should not be divided. The flesh-wound adds very little to the immediate or later danger of the operation, while it may be the means of averting a catastrophe.

Second, is it necessary to perform a preliminary tracheotomy? Unless the tumour is of very large size, and there appears reason to apprehend serious difficulty in removing it, I do not think this need be done. But for tumours of greater magnitude, where it is very important to prevent the entrance of blood into the air-passages, the introduction of Hahn's tube into the trachea affords an admirable security against danger. The tube may be removed as soon as the operation has been completed.

Third, is it necessary or desirable to ligature the common carotid artery before proceeding to remove the tumour? To this question I should reply decidedly in the negative. In cases in which the disease is limited to the palate and gums or alveolar process of the upper jaw, I cannot conceive that so severe an operation is necessary. And in cases in which the disease is so extensive or so situated that the preliminary ligature of the carotid seems to be necessary to its safe removal, I should not attempt to remove it.

Results of Operations.—Operations were performed in twelve of the cases collected by Mr. Paget—in ten cases of sarcoma, two of carcinoma. Unfortunately, the further history of the patients was recorded only in a very small number of instances.

One patient died of the operation, a woman fifty-three years old, from whose soft palate and pharynx Dr. Macleod removed a large tumour. A preliminary tracheotomy was performed, the lower jaw was divided and the tongue drawn well forward, while, to prevent blood running into the trachea, a sponge was introduced into the upper part of the larynx. After all these precautions, it seems almost absurd to say that the tumour was easily enucleated with the fingers through a single incision, without any serious or embarrassing hæmorrhage; but the large size of the tumour and the difficulty of reaching it appear to have justified the preliminary steps. On the day following the operation there was slight congestion of the lungs, distress produced by the presence of the tube, and flatulence; and on the next day the patient died of exhaustion. The tumour was a round-celled sarcoma, which had been growing about two years, and had reached such a size as seriously to interfere with respiration and deglutition. Dr. Macleod thinks that he ought to have removed the tube as soon as the removal of the tumour was completed. Considering the severity of some of the operations which were performed, I am almost disposed to regard it as a fortunate chance that it is necessary to record only one death as due to the removal of the disease. In two instances the carotid artery was ligatured, In one case—the only case in which there is a record of a second operation—a recurrent melanotic sarcoma was removed by cutting away the soft and the greater part of the hard palates, both tonsils and part of the pharynx. On the other hand, several of the growths were shelled out without difficulty or hæmorrhage, and one was removed easily after the parts had been painted with a 20 per cent. solution of cocaine.

Recurrence of the disease took place in the case which has just been mentioned, but the recurrent tumour was not removed until four years had elapsed after the first operation. The patient recovered from the second operation; but the later history is not recorded. Recurrence was noted in two other instances. The disease in one of them was a spindle-celled sarcoma, which grew from the periosteum of the hard palate. It was removed with the chisel and mallet, and in order to ensure against recurrence the bone was freely removed from which it grew. But, in spite of this precaution, recurrence took place in a few months. The tumour in the second case was a carcinoma, which had been growing about three months in the substance of the soft palate. It was easily enucleated by Mr. Langton, but at one point was adherent, and required to be dissected away. Six weeks after the operation there was recurrence, and in the marvellously short space of three weeks the patient died of the disease. The cervical and mediastinal glands were found to be affected, and both lungs were the seat of secondary deposits. While speaking of recurrence, a case recorded by Mr. Treves must not be lost sight of. The patient was a man sixty-eight years old, from whose soft palate Mr. Luke had removed a growth thirty-seven years previously. He had at that time been told that the disease would probably recur, but remained quite well until eight months before he came under the care of Mr. Treves, when a small lump was noticed in the exact situation from which the former tumour had been removed. Mr. Treves cut out the new tumour, which proved to be an alveolar sarcoma, and the patient made a rapid recovery, although his carotid artery was ligatured. The nature of the relation between the first and second tumours must be classed as a pathological mystery.

Not one of the patients can be regarded as permanently relieved by operation, for in only one instance is there a record of good health for some time after the removal of the tumour, and the duration of good health in that case was only eight months.

The remaining patients had been lost sight of.

Conclusions.—There are no materials from which we can draw any just conclusions with regard to the probability of successful treatment of malignant tumours of the palate, whether sarcomas or carcinomas.

It is, however, evident that many such tumours may be readily and safely removed, unless they are of very large size.

It is further evident—and this is a valuable piece of information which we derive from Mr. Paget's paper—that many of these tumours can be enucleated easily after a single incision has been made through the structures covering them.

CHAPTER XV.

TONSIL.

The tonsil is subject to both sarcoma and carcinoma, particularly, if not solely, to lympho- or round-celled sarcoma among the sarcomas, and chiefly to epithelioma among the carcinomas. For practical purposes it is scarcely necessary to consider separately the two diseases, for they appear to be equally, and in essentially the same manner, fatal. I shall therefore include them under the common name of malignant disease or cancer, and shall only mention one or two points in which they differ from each other.

Males are much more subject to tonsillar cancer than females, and the disease, of whatever kind, attacks almost invariably males of adult age. But while epithelioma is a disease of middle and advancing adult age, sarcoma may occur in much younger subjects, and has been often observed in persons under twenty years of age. Epithelioma quickly breaks down and ulcerates, forming deep and foul cavities; but sarcoma far more frequently forms a distinct and prominent tumour, which may be rounded, smooth, and unbroken on the surface, or ulcerated more or less deeply. In the few cases in which soft carcinoma has been observed and confirmed by microscopical examination, the disease has formed a prominent tumour similar to that produced by sarcoma. No matter what the variety of the disease, it runs a peculiarly rapid course to death, affecting the lymphatic glands at a very early period, and producing large and wide-spread tumours in the neck. This circumstance, so fatal to all attempts to cure by operation, may be explained by the very intimate relation which exists between the tonsil and the cervical lymphatic glands. Even the ordinary chronic enlargement of the tonsil is almost invariably associated with enlargement of the cervical glands; it is therefore not to be wondered at that carcinomas which affect the glands at an early period in other parts of the body, have a still greater tendency to do so when they originate in parts which are so closely connected with the glands as are the tonsils. And when the peculiar character of the primary sarcomas of the tonsil, their similarity to the structure of the organ, whether in health or in disease, is taken into account, it must be admitted that the absence of glandular affection in connection with primary sarcoma of the tonsil would be more remarkable than its occurrence. So early in the course of the disease are the glands affected that they may appear as large swellings in the neck within a few weeks of the period at which the first signs of disease were noticed by the patient. On the other hand, there may be no visible or tangible glandular enlargement until six or more months have elapsed from the first occurrence of enlargement of the tonsil. The disease proves fatal, in very many instances, within a year or even six months of its first appearance; indeed, few persons survive for more than three-quarters of a year. The end is brought about in many of the cases of sarcoma by hæmorrhage; in other cases by exhaustion due to dysphagia and discharge, or a combination of various causes. Among these causes, that which probably plays by no means an unimportant part is the occurrence of secondary affection of internal organs and tissues. For although the number of autopsies on which we can rely for information is small, the comparative number of instances in which secondary affection was present is large, even although the disease was only known to have existed for a few months. This again will not appear striking to those who are acquainted with the malignancy of the peculiar form of sarcoma which attacks the tonsil, and with the rapidity with which round-celled or lympho-sarcoma of other parts of the body—the testicle, the bones, &c.—becomes generalized.

Methods of Operation.—The method which is selected will depend chiefly on the character of the disease and the presence or absence of affection of the lymphatic glands. The tonsil may be removed from within the mouth or through an opening in the side of the neck. When the glands are enlarged, the operation from within the mouth can only be regarded as a palliative measure, unless at the same time an attempt is made to remove them through an external incision. I shall describe both methods of removal, and state the conditions under which either of them may be employed.

Removal through the Mouth is much more frequently practised for sarcoma than for carcinoma, for the very good reason that the former usually forms a prominent tumour, and, in the earlier stages of the disease at least, does not so far involve the neighbouring structures that it cannot (apparently) be removed completely. The mouth is widely opened by means of a gag, the patient placed, with the head slightly raised, in face of the best light which can be procured, and anæsthesia is maintained through the medium of a tube introduced at the side of the mouth or through the nose. The instrument used for the actual removal is either a benzine cautery, a galvano-cautery, or an écraseur. With the first of these, the hot knife (at a red, not a white heat) is made to cut through the tissues at the base of the tumour from before backwards. With either of the other two the loop is passed round the base of the growth as far down as possible. If the galvano-cautery is employed, the loop is heated to a dull red heat, and in either case the mass is cut slowly through, which is usually easily performed, for the tumour is generally soft. It is curious how little hæmorrhage occurs in the large majority of cases, even when the écraseur is used, especially when the vascularity of these growths is remembered. Instead of employing a cautery or écraseur, the finger may be the only instrument required, and the growth may be even more completely removed than with cautery or écraseur; for some, if not many, of the tumours are found to be easily separable from the bed or set in which they lie, and are so circumscribed, if not encapsuled, on the under aspect, that there is not the least difficulty in shelling them out. Unfortunately, they are not the less prone to recur, even *in situ*; and a new growth may appear as speedily and certainly as if there had been great difficulty in defining the limit of the primary growth and separating it from the surrounding tissues. Hæmostatics, or other special means of arresting the bleeding which takes place after the removal, are scarcely ever needed; nor is any special after-treatment necessary more than would be required after the removal of a simple enlargement of the tonsil.

In cases in which the disease in the fauces is much more advanced, affecting the base of the tongue, the half-arches of the palate or the margin of the palate itself, it may still be removed with safety through the mouth, care being taken to use instruments which shall be tearing and bruising rather than cutting. In such cases cauteries are also peculiarly applicable. The operation through the mouth is, however, rarely employed in advanced cases, unless for palliative purposes, on account of the almost certain affection of the cervical glands.

Removal through an incision in the Neck was, I believe, first practised by Cheever, but has since been adopted by Czerny and other surgeons. It appears to be a very formidable proceeding, on account of the depth at which the tonsil is seated and the number and importance of the structures which lie between it and the skin; but in truth it is far less formidable than might be thought, and permits not only a free removal of the affected tonsil, but also of any glands which are enlarged. The method of performing the operation varies according to the condition of the tonsil, whether it is apparently easily separable or not, or whether the disease has widely involved the surrounding structures.

The proceeding of Cheever consists in making an incision, about three or four inches in length, along the anterior border of the sterno-mastoid muscle, from the level of the ear to below the level of the tumour (which can probably be felt through the neck). A second incision is made, at an angle to the first, along the body of the inferior maxilla. The dissection is carried carefully down through the intervening textures, drawing the vessels and nerves aside, until the tonsil is reached, when it is removed with as little actual cutting as possible, perhaps by means of one of the cauteries.

The operation practised by Czerny is of a much more formidable character. The patient is placed deeply under the influence of chloroform, and, to guard against the entrance of blood into the trachea, a preliminary tracheotomy is performed, and Trendelenburg's or some equally efficient canula is introduced. An incision is then made downwards and outwards, from the angle of the mouth to the anterior border of the masseter muscle, and beyond it to the level of the hyoid bone. Through this incision the lower jaw is exposed and sawn through, between the second and third molar teeth, in a direction from above and internal, to below and external, and the two fragments of the bone are held asunder. The tumour is by this means laid bare, and to remove it, it may be necessary to divide the digastric, stylo-hyoid, and stylo-glossus muscles, the hyo-glossal, glosso-pharyngeal, and gustatory nerves, as well as the lingual and other vessels. The tumour is then cut or torn out, and bleeding points are touched with the cautery. The wound is thoroughly washed out with carbolic lotion or dusted with iodoform, or treated in such an antiseptic manner as seems best; the fragments of the lower jaw are brought together by means of a silver wire passed through the middle of both, a second wire is twisted round the second and third molar teeth, and the external wound is closed with sutures, except at the points where it is deemed expedient to insert drainage tubes. The opening in the mucous membrane within the mouth may also be brought together with sutures if it is desired to hasten the healing or prevent discharges from making their way into the stomach or lungs.

During the first few days after the operation the patient should be fed through a tube twice in the twenty-four hours, and the tracheotomy tube may with advantage be retained. If the case makes good progress, the tracheotomy tube and the introduction of food through a tube may be quickly dispensed with, and in the course of a fortnight the silver wire may be removed from the molar teeth. The wire through the fragments of bone may be left there permanently if it does not produce any irritation.

Mickulicz (*Deutsche Med. Wochenschrift*, xii. 157, 1886) has practised in several instances a more radical operation than even Cheever and Czerny. Making an incision from the mastoid process downwards and forwards as far as the greater horn of the hyoid bone, and raising the soft parts from the jaw-bone, taking care to respect, if possible, the facial nerve, he separated with a raspatory the periosteum from the outer and inner aspects of the lower jaw just above the angle. He then sawed through the jaw beneath the periosteum, divided the tendon of the temporal muscle, and resected the ascending process of the bone. After drawing aside with strong hooks the body of the jaw, the masseter, internal pterygoid, digastric and stylo-hyoid muscles, he found the surface of his wound corresponded as nearly as possible with the region of the tonsil, and by dividing the lateral wall of the pharynx he obtained access to the palate, the base of the tongue, and the posterior wall of the pharynx as far up as the naso-pharynx; and by dividing the digastric muscle and the hypoglossal nerve he could reach the entrance of the larynx. By this proceeding the lymphatic glands were removed if needful, and the operation completed up to the final act, without opening the cavity of the mouth and pharynx; so that complete narcosis could be maintained, and the entrance of blood prevented almost through the entire operation. Nevertheless, he found it expedient to perform a preliminary tracheotomy with the use of Trendelenburg's (or Hahn's) tube.

Mickulicz claims for this operation not only ease in reaching and removing the disease, and in dealing with the lymphatic glands, together with the advantages which have just been mentioned, but further, that the whole wound communicates freely with the outside, and can be dressed antiseptically. So far from the resection of the ascending process of the jaw being a disadvantage, it offers a positive advantage; when the operation has involved the palate and base of the tongue, there results, in cases in which this resection has not been performed, so considerable a contraction of the scar as seriously to affect the movements of the lower jaw, but after the resection of the process this contraction is not experienced.

Results of Operations.—In the last chapter of *Sarcoma and Carcinoma* I collected a table of twelve cases of malignant disease of the tonsil, but in only six of these had any operation been performed for the removal of the disease. I have added to these six, seventeen other cases collected from various sources; thus making a total of twenty-three cases. The number is of course very small, but every surgeon who is acquainted with the comparative rarity of the disease, and with the small proportion of cases in which an operation is practicable, will know how difficult it is to collect even so small a number as this. In the *New York Medical Record* for 1885 (xxvii. 264), Dr. Donaldson, jun., published a case of primary epithelioma of the tonsil, and at the end of the paper appended a list of all the cases of "cancer" of the tonsil which he had been able to find in literature. This list, which he regarded as "complete," referred to seventy-one cases of malignant disease of all kinds. But many of the references were merely to statements of authorities that they had seen one or more instances of cancer of the tonsil; and in very few of the cases had any operation been performed. The list, however, is not complete (up to the date of the paper). Dr. Donaldson does not seem to have been aware of the chapter on "Malignant Disease of the Tonsil" in my book, and has therefore omitted several of the cases which were recorded or referred to there—cases which were important from two aspects: first, because the nature of the disease was verified by microscopical examination; second, because in several of them extensive operations had been performed.

Mortality due to the Operation.—Three of the twenty-three patients died of causes due to the operation, which in two of them was pharyngotomy by Mickulicz's method; in the third, removal of the disease from within the mouth. In this case, in which the operation was performed by Velpeau, the patient died of purulent infiltration on the eighteenth day after the operation. Mickulicz lost one of his patients between two and three hours after the operation, from collapse and the entrance of blood into the air-passages. Küster, operating much in the same manner as Mickulicz, lost his patient on the eighth day, from pneumonia and suppuration in the posterior mediastinum. Nor is this much to be wondered at, for the patient was sixty-one years old, and the operation lasted *two hours and a half.*

Considering the severity of many of the operations, the relations of the parts which were removed, the age of the patients, and the danger of primary and secondary hæmorrhage, I do not think the mortality can be regarded as excessive. It amounts roughly to about thirteen or fourteen per cent. If the relative mortality of the operations performed through an external incision (pharyngotomy) is compared with that due to the operations performed from within the mouth, a great difference, as might be expected, will be found. The number of pharyngotomies was ten; of operations from within, thirteen. Two of the former proved fatal, only one of the latter; the mortality of the pharyngotomies is therefore 20 per cent., that of the internal operations, 7.69. It is of course possible that these numbers might be reversed in a much larger number of cases, but it is in the highest degree improbable. Indeed, the probability is, that the difference would be still more marked.

I have often thought that the removal of malignant disease from the interior of the mouth is much less dangerous than it might be expected to be. I have myself seen a large sarcoma removed with the écraseur without much more hæmorrhage than usually attends removal of a simple hypertrophy of the tonsil in an adult; and the history of all these operations tells much the same story. Whether the removal was effected with the galvano-cautery, the thermo-cautery, the écraseur, or the knife, it has never been attended, so far as I am aware, by serious hæmorrhage. One condition of many of the sarcomata has not been made sufficient use of; their relation, namely, to their surroundings. They are not uncommonly so loosely attached to the bed in which they lie that they can be shelled out after an incision has been made through the capsule of the growth. It may be said that the mere shelling out of such a tumour as a round-celled or lympho-sarcoma is not a radical operation, or likely to lead to permanent relief. But the question will presently arise, whether the more active and "radical" operations are justified by the probabilities of permanent success which they offer.

Cures due to Operation.—The general results of the twenty-three cases are as follows:—Three of the patients died of causes connected with the operation; three were lost sight of after their recovery; ten were dead or dying of recurrence of the disease, and in nearly every instance the recurrence and death took place within a few weeks or months (far less than a year) after the removal of the disease; two were dead or dying of affection of the lymphatic glands without actual recurrence in the tonsil; two died at the end of three and seven months respectively—the former of a cause which is not reported, but which was very likely recurrence or secondary growth of the disease, the other of apoplexy; three were alive and well at periods of four, twelve, and twenty-four months after the performance of the operation.

Little can be said of the case in which the period since the operation was only four months; the time is too short to allow of even a hope of long relief, much less of cure. I may, however, say that the tumour was shelled out from the inside, and that an enlarged gland at the angle of the jaw was not interfered with. When the patient was last seen this gland did not appear to have increased in size, but on the other hand had not subsided.

The account of the second case I owe to Mr. Barker, who has not yet published it in detail. The patient was a man, more than seventy years of age, who suffered from lympho-sarcoma of the tonsil of about three months' duration, and from affection of the glands behind the jaw. Both glands and tonsillar disease were removed, the former through an incision in the neck, the latter from the mouth. The patient made a good recovery, and in spite of some suspicious enlargement of the other tonsil and of the associated cervical glands, was well when last seen, a year or more after the operation.

The third and most important case was published by Dr. Gorecki in *Le Practicien* of 1879, and the report was kindly supplemented by a letter which I received from the author in 1881. The patient was an employé in the posts, who first noticed enlargement of the right tonsil in November 1878. By the end of the month the tumour was as large as a walnut, rounded and smooth. In February it was cut out with the thermo-cautery knife. On section it had a grey-rose colour and friable texture, had infiltrated the subjacent muscle, and was microscopically a well-marked specimen of lympho- or round-celled sarcoma. There was no enlargement of the lymphatic glands, and the operation was limited to the removal of the tonsil. The patient was alive and quite free from all sign of disease two years later, when Dr. Gorecki wrote me.

These are the best results which can be thus far claimed for any operation for the removal of malignant disease of the tonsil. There is not one of the three which can be regarded as a case of cure, for the three years' limit had not been reached in one of them. Now, it is worthy of note that the diseased tonsil was removed in each one of these cases from within the mouth, and the external incision was only used in one instance for the removal of the affected lymphatic glands. It is further very important to observe that there was no affection of the glands in the most successful of the three. Here, therefore, as in the case of malignant disease of other parts of the body, the rule appears to hold good, that operations of minor severity are the most successful, and that the best chance of success lies in removing the disease before there is any affection of the glands, and not in the removal of the primary tumour and the diseased glands by a large and dangerous operation.

Of pharyngotomy I should say that, in addition to having hitherto proved very fatal, it has not yielded one good or even moderately good result, were it not for the partial success which attended the first operation performed by Mickulicz. He removed, by the operation which has been described, a large tumour of the tonsil and affected lymphatic glands from a woman sixty-five years old, after the disease had existed about four months. She recovered, and remained well and free from disease for two years, when recurrence appeared in the glands. Six months later, at the time of the last report, she was still alive, but slowly dying of the disease. The operation cannot therefore be wholly condemned until we have a larger number of results before us.

In the paper already alluded to Dr. Donaldson says: "The prognosis of all such cases is very grave, and the treatment at best but palliative, unless the growth can be removed in its very incipiency. A radical operation later seems hardly justifiable. Froelich, however, mentions a case successfully operated upon by Professor Czerny; Quintin, one which showed no sign of return after one year and a half; and Mickulicz, the case of a woman operated upon by himself, which had not returned six months after." The case reported by Froelich is probably that recorded by Braun in Czerny's *Beiträge*, and the disease quickly recurred. Quintin's case is published in a journal to which I have not had access; and the case of the woman treated by Mickulicz is that of which an account has just been given.

Are patients who are not cured, relieved by operation? On this point the answer must be decidedly in the affirmative, provided the tumour is so situated and of such a kind that it can be readily reached and removed through the mouth. Those cases are peculiarly fitted for a palliative operation in which the disease is large, rounded, and prominent, as some of the lympho-sarcomas are. In such cases, whether the glands are enlarged or not, the primary disease may be shelled out or removed with the galvano- or thermo-cautery with little danger or difficulty, and with great and almost immediate relief of dysphagia and sometimes of dyspnœa. The relief may not be of long duration, for the disease runs its course in most cases very quickly; but in some instances there is no local return, in others the recurrence is deferred for three, four, or more months, and in the case reported by Mickulicz there was absolute freedom from disease for a period of two years, and even then the recurrence was not in the tonsil.

Conclusions.—The prospect of permanent relief by operation in any case of malignant disease of the tonsil is very small, even if there can be said to be any.

Removal of the disease through an external incision (pharyngotomy) has hitherto proved a dangerous proceeding, and has not yielded as good results as operation through the open mouth.

Removal of the disease through the open mouth, in suitable cases, has not hitherto proved very dangerous.

No case of cure can be claimed for operation through the open mouth, but several cases of relief of longer or shorter duration.

In future cases, pharyngotomy cannot be *recommended*; and unless the results procured by it are far better for the next series of cases than those which it has yielded hitherto, it must be condemned as an unjustifiable proceeding.

CHAPTER XVI.

LARYNX.

The larynx is subject to sarcoma and carcinoma, but much more to the latter than to the former. For practical purposes, particularly with regard to operative treatment, it is necessary to consider the two diseases separately, and further to divide the intrinsic from the extrinsic carcinomas. The intrinsic are those which grow from the vocal cords, the ventricles, the false cords, and the parts below the true cords. The extrinsic tumours are those which take their origin in the epiglottis, the ary-epiglottic folds, the inter-arytenoid fold, and the parts forming the framework of the larynx. On the other hand, it is not needful to separate the different varieties of carcinoma or the different varieties of sarcoma.

Sarcoma may arise in almost any part of the larynx, but much more commonly grows from the intrinsic than the extrinsic parts. It attacks males much more frequently than females, and although it is not limited in its occurrence to any age, is essentially a disease of adults. The tumour may vary much in outward aspect, and may form an actual tumour or an irregular papillary or warty growth. Unlike the simple papillomata, however, it usually forms at the same time a distinct mass, and is sessile, not pedunculated. It grows on the whole slowly, and slowly affects the subjacent tissues, and in this manner may extend from the larynx to the tongue and pharynx, from the cords to the framework of the larynx. There is little or no tendency to secondary affection of the lymphatic glands, nor does it appear at all likely to produce secondary growths in the internal organs or other tissues of the body. It is therefore essentially a local disease, capable of producing extensive destruction of the larynx and implicating all the surrounding structures; but very rarely, so far as our present knowledge teaches, producing secondary sarcomas. The tendency of the disease is to cause death from suffocation or exhaustion, and this may take place within a year or eighteen months of the first appearance of the symptoms. But the course of the disease is in most instances much slower; and even if suffocation is not averted by tracheotomy, the patient may live for two, three, four or more years.

Intrinsic carcinoma may grow from the false or true cords, from the thyroid angle, the ventricle, or from the parts below the cords. It has frequently the aspect of a warty growth, but may form a distinct tumour, and may not at first be distinguishable from a simple tumour or a sarcoma. Ulceration takes place almost invariably at an early period, and, what is more important for our purpose, the disease infiltrates the subjacent structures, and spreads from the part in which it took its origin to the adjoining parts of the interior of the larynx, and thus in many instances involves the entire organ. From the interior of the larynx it may reach the surrounding structures. The lymphatic glands are only occasionally affected. There is little probability that the internal organs or distant parts of the body will be the seat of secondary growths. The disease is rarely rapid in its progress, and although death may ensue within a year, it is much more usual for the fatal termination to be delayed for two, three, four or more years.

Extrinsic carcinoma is a much more formidable affection. It may originate in the epiglottis, the ary-epiglottic folds, the arytenoids, and the upper and posterior parts of the inter-arytenoid fold. From the part in which it takes its origin it usually quickly spreads to the surrounding parts, and may involve the pharynx, tongue, tonsils, and palate. The lymphatic glands are affected in the large majority of instances, and at a comparatively early period of the disease. But, as in the case of intrinsic carcinoma, there is very little probability that the internal organs will be the seat of secondary growths. The duration of life is shorter than for intrinsic carcinoma, so that many of the patients die within a year or eighteen months; yet it is not impossible that life may be prolonged for two or three years.

Both intrinsic and extrinsic carcinoma attack men far more frequently than women, and are diseases essentially of adult age.

In considering the desirability of radical operations for malignant disease of the larynx, it will have to be borne in mind that life is in a large number of instances prolonged by tracheotomy, so that death from suffocation, which might naturally be expected from the situation of the disease at the entrance to the air-passages, is comparatively rare.

Methods of Operation.—Whether for sarcoma or carcinoma, removal of the disease *per vias naturales* has afforded such unsatisfactory results that it is not needful to take it into consideration. A very few cases of sarcoma have been operated on with the forceps, the snare, the galvano-cautery, &c., through the mouth, by the aid of the mirror; but the measure of success, estimated even by the most ardent admirers of endo-laryngeal methods, is not such as to tempt a repetition of treatment.

Supra-thyroid Laryngotomy has been performed on several occasions for the removal of growths situated at the upper opening of the larynx, particularly in connection with the epiglottis. A transverse incision is made through the thyro-hyoid membrane along the lower border of the hyoid bone. The incision divides the skin, the superficial fascia, inner half of the sterno-hyoid muscles, the membrane itself, and the mucous membrane, between the base of the tongue and epiglottis. The epiglottis is seized and drawn through the wound, and the growth is removed in such a manner as appears most suitable to the individual case. The length of the incision and the structures which are divided vary according to the size and situation of the tumour. The vessels wounded are usually few in number, and of very insignificant size. After the operation the edges of the wound are brought together, and healing takes place quickly.

Infra-thyroid Laryngotomy is suitable for those cases in which the growth is situated on the under aspect of the cords, or actually below the cords. It is customary, a few days before an attempt is made to remove the disease, to perform laryngotomy, and insert a canula, taking care not only to divide the crico-thyroid membrane but to dissect away the connective-tissue, muscle, and other soft parts (including the membrane), which occupy the space between the two cartilages. Although this is the usual course in the removal of innocent tumours by this method, chiefly because the growth is removed finally by the aid of a mirror, as it is *per vias naturales*, and therefore the operation cannot be completed until the soreness caused by the wound has subsided and all tendency to hæmorrhage has ceased, it is not necessary to defer the completion of the operation when it is practised for the removal of a malignant growth. As soon as the bleeding has been thoroughly arrested, the opening between the cartilages is enlarged as much as possible by throwing the chin back and drawing them apart with retractors, when an attempt is made to remove the disease with forceps, sharp spoon, and the after-application of caustics or the galvano-cautery. After the removal has been completed the edges of the wound are brought together, and it is allowed to close, or, if there is any doubt whether dangerous dyspnœa may result from the necessary violence used in the removal, a laryngotomy tube may be left in for several days until the danger due to inflammation and spasm has passed.

Thyrotomy may be performed in those cases in which there is limited disease within the larynx, which cannot be fairly reached either by the supra-thyroid or the infra-thyroid laryngotomy. To guard against the danger of hæmorrhage into the trachea and lungs, and the consequent danger of suffocation during the performance of the operation, it is safer to perform a preliminary tracheotomy, either immediately before the thyrotomy or some days previously. The incision for thyrotomy is made in the middle line, along the angle of the thyroid cartilage, from the notch to the upper border of the cricoid cartilage. The thyroid cartilage is then divided by a succession of nicks, with a short, strong, sharp-pointed knife; or, if necessary, with a small saw. If possible, the knife is not permitted to enter the larynx until the whole length of the cartilage has been divided. The alæ are separated as widely as possible with strong retractor hooks. In order to effect this, it is sometimes necessary to divide the crico-thyroid, and even the thyro-hyoid membrane. As strong a light as possible is now thrown into the larynx, for which purpose the forehead mirror, or a small electric lamp, may be employed, and the disease is removed with forceps, knife, sharp spoon, or scissors, to which is sometimes added the galvano-cautery or actual cautery, to arrest the hæmorrhage. Mackenzie, whose account of the operation I have chiefly availed myself of, uses nitrate of silver in preference to the cautery; but his object is rather to destroy the base of an innocent growth than to arrest hæmorrhage. For my own part, I decidedly prefer the galvano-cautery, on account of the ease with which it can be used and the precision with which the degree of heat can be regulated.

After the growth has been removed and the bleeding has been stayed, the two alæ of the thyroid cartilage are brought together and fastened with a couple of silver sutures. For the first few days the canula is left in the trachea, until the danger of suffocation from swelling and spasm has passed.

Excision or Extirpation of the Larynx was first performed for malignant disease in 1873 by Billroth. Since that date the operation has been many times performed, so that Hahn was able last year (1885) to tabulate seventy-four cases of complete excision for malignant disease or growths of the larynx, and ten cases of partial excision. Hahn's work (Volkmann's *Sammlung klinischer Vorträge*, No. 260, 1885) is so complete, and gives so excellent an account of the operation, the results, and the management of cases, that I shall avail myself largely of it in this section. He has performed the operation himself no fewer than eleven times, and is therefore entitled to speak with authority on the method, particularly as he has been very successful so far as the immediate result of the operation is concerned. Of the more remote results of his and other surgeons' operations I shall speak presently, and shall certainly find occasion to criticize somewhat severely the reckless manner in which excision of the larynx has been employed.

Whether the whole or only a part of the larynx is removed, it is necessary, before all things, to provide against the passage of blood and discharge down the trachea, both at the time of and after the operation. To this intent tracheotomy is performed, either immediately before proceeding to the major operation, or several days or even a week or two previously. In cases in which the patient is generally in good condition, and has not suffered much from dyspnœa or dysphagia, and consequently from emaciation and great loss of strength, the tracheotomy may be performed at the time of the excision. But in cases in which the patient is emaciated and exhausted, there can be no question that it is essential to success that tracheotomy should be performed some time previous to the excision, and that means should be taken to improve the general condition.

The tracheotomy tube is a subject to which too much attention can scarcely be devoted. During, and for some hours at least after, the operation it is not merely a channel through which air enters the lungs, but a means by which the lungs are protected from the entrance of blood and discharge. The now well-known canula-tube of Trendelenburg needs no description. Every one knows the india-rubber sac with which its lower end is provided, and the manner in which the sac is distended with air or water when the tube is lying in the trachea. But those who have employed it also know that it has some defects—that the sac is liable to give way, that the surface of the india-rubber is apt to become slippery and the tube in consequence to slide up in the trachea, and that the principal object for which it is used (the prevention of the entrance of liquid and especially of blood into the trachea) is not always fulfilled. For these reasons I confess the tube recommended by Hahn appears to me to be preferable. It is of course suggested by that of Trendelenburg. It consists of an inner and an outer tube. The inner is much longer than the outer, so as to project for an inch or an inch and a half in front of the shield. Blood is thus very unlikely to find its way into the mouth of the tube. And in order to prevent this projecting piece of metal from inconveniencing the operator, it is made to bend down parallel with the trachea for about an inch before it stands out at right angles to the neck. The lower end of the outer tube is provided with a raised rim, about 2mm. in height, and from this rim up to the shield is covered with a layer of *compressed* sponge, which has been previously to the pressing soaked in a solution of iodoform and ether (1 in 7). The sponge is laid down over the tube, and fastened by stitches on its concave aspect, in addition to which a silk thread is carried round its upper and lower end. Shortly—*i.e.*, in ten minutes or a quarter of an hour—after this tube has been introduced, the sponge swells up from the absorption of moisture, and an absolute obstruction to the entrance of liquids into the trachea is provided.

The actual operation of excision of the whole of the larynx is performed in the following manner:—The patient, having been placed under the influence of an anæsthetic, and the head thrown well back, so as to expose as much as possible of the neck, an incision is made in the middle line, from the second or third tracheal ring upwards as far as the interval between the hyoid bone and thyroid cartilage. From the upper end of this incision a transverse incision is made on either side, parallel with the cornu of the hyoid bone. The flaps thus formed are turned back after division (as far as may be necessary) of the sterno-mastoid muscles. At this point it is desirable to ligature the thyroid arteries: the superior and inferior can be found at the outer border of the thyro-hyoid muscle, the former just above the upper border of the thyroid cartilage, the latter at its lower border; while a third artery, to which the name of middle thyroid is given, may be found about the middle of the cartilage and also at the outer border of the thyro-hyoid muscle. If the disease is limited to the interior of the larynx, the latter should be freed from the soft parts covering it, particularly the thyro-hyoid and sterno-thyroid muscles; the thyro-hyoid membrane should be incised, and the crico-thyroid membrane, or the membrane between the cricoid cartilage and the first ring of the trachea (according to the intention of the operator to leave behind or remove the cricoid cartilage), and the larynx, should be removed, each small artery being ligatured as it is divided. The greatest care must be taken in separating the soft parts from the cartilages at the back part of the sides, for there the carotid artery lies near the larynx, and may be wounded. To avoid this catastrophe it is most important to keep as close as possible to the cartilages. Hahn recommends, as less dangerous than the knife, that scissors should be employed during this part of the operation, and that their rounded points should be made to divide the structures with numerous short cuts.

The operation is thus practically completed, but the description does not take into consideration several points of greater or less importance. In the first place, it may be found, when the flaps have been turned back and the soft parts are examined, that the disease has penetrated into the muscles covering the larynx, and the operator will have to decide whether to pursue or to abandon the operation. It need scarcely be said that affection of the surrounding structures largely diminishes the prospect of a permanent cure of the disease. More than this, the condition of the patient, if he recovers from the operation, is not nearly so good as when the larynx alone has been removed, for the mechanism of swallowing is seriously impaired.

In those cases in which the disease is clearly limited to the interior of the larynx, Hahn recommends that the thyroid cartilage should be split along the angle, the two halves separated, and the interior examined, to discover how far it may be needful to remove the larynx in order completely to remove the disease. With this suggestion I entirely agree, for the advantage to the patient of leaving any part of the organ can scarcely be over-estimated. On the other hand, it must not be forgotten that the object of the operation is to remove the disease thoroughly, and every other object must be made subordinate to this.

The removal of the epiglottis and the cricoid cartilage may be a necessary part of the operation, in order completely to remove the malignant disease; but if they are sound, these structures may be left. Hahn, however, removes the cricoid cartilage in all cases of excision of the entire larynx, because he considers that the act of swallowing may be greatly interfered with if the cartilage is left behind; and, for this reason, when the thyroid cartilage is split, he does not at the same time divide the cricoid, since he finds it can be more easily removed unbroken.

As soon as the bleeding has been completely stopped the wound is filled with strips of carbolic gauze, a soft india-rubber tube is passed into the stomach, and the patient is propped up in bed. The gauze needs changing about once in every twenty-four hours, and may require to be renewed more frequently on account of the rapidity with which it becomes soaked with saliva, &c. An ordinary tracheotomy tube covered with iodoform or carbolic gauze may be substituted for the compressed sponge tube at the end of twenty-four hours. The gauze with which it is covered may be sufficiently thick to prevent any discharges from making their way into the trachea, and should be changed once a day. It is very important to keep it thoroughly sweet and clean, as a preventive measure against the pneumonia which has so frequently proved fatal during the first days after the excision. During the first few days at least, and perhaps for several weeks, the patient is fed through the india-rubber tube; but about the end of the first week, or earlier, Hahn is in the habit of encouraging his patients to attempt to swallow through the mouth. Solid food is usually best swallowed, but even this may pass into the trachea, while liquid food almost invariably does so.

It is scarcely within the scope of this work to discuss the restoration of the voice by means of an artificial larynx. The proof has been frequently forthcoming that patients may be enabled with the aid of such an instrument to speak both clearly and loudly. The artificial larynx may be introduced from two to four or five weeks after the removal of the real organ. The disadvantages with which its use is attended are, that there is often considerable noise associated with the act of inspiration, and the glottis is apt to become so clogged with mucus and saliva, even after it has been in place only a very short time, that it requires to be taken out and cleansed before it is fit for use.

The above description has been made to apply wholly to complete removal of the larynx, but several modifications may be made when the operation is limited to removal of half the organ. The preliminary ligature of the thyroid arteries is unnecessary; indeed, they will probably not need to be ligatured at all. As soon as the flaps have been turned back the thyroid cartilage is divided, and the interior of the larynx is carefully examined to discover the exact seat and extent of the disease. If the tumour is found to be intrinsic, and quite limited to one-half of the larynx, the affected ala of the cartilage is bared on its outer aspect, chiefly by means of blunt-pointed scissors and elevator. The upper and the lower margins are treated in the same way. The upper and the lower cornua are divided close to the ala; and the cartilage, with the soft parts covering its inner aspect, is removed. The division of the parts must be very carefully made by short snips with blunt-pointed scissors, and bleeding vessels should be taken up and tied as they are divided. Care should be taken to avoid opening the pharyngeal cavity during this part of the operation, particularly when the tissues are drawn forward in order to bring them within reach of the operator.

I am myself in favour of limiting the operation even more than in the partial proceeding just described. When the disease is of very small extent, limited to the true and false cords of one side, not extending into the structures above and below, not even adherent to the cartilage, I believe the better course to pursue will be to remove the diseased structures and a wide area of the surrounding soft tissues, just in the same manner as one treats an epithelioma of the lip, without insisting on the removal of even one half of the thyroid cartilage. Cartilage, whether calcified or not, is peculiarly resistant to the progress of cancer, and when the disease appears to be adherent to it, it is the perichondrium which is affected, and only in the rarest instances the cartilage itself. Cancer of the larynx far more often causes the death of the cartilage piece by piece, than infiltrates it. After the soft parts over it have been removed, the ala may be left with perfect safety, provided its surface is not broken; and even then it had better be scraped and cauterized than removed. It is an immense advantage to the patient to retain the framework of the larynx.

In these operations for the removal of half the larynx for intrinsic disease there is usually not the least necessity to remove the cricoid cartilage.

The after-treatment is the same as when the entire larynx has been removed; but the patient will probably be able to take semi-solid food by the mouth within three or four days after the operation, and the canula can often be dispensed with in the course of a few days.

In reference to the canula which is employed to replace the large tube of Hahn at the end of the first twenty-four hours, I may say that an ordinary tracheotomy canula is not sufficient. A very large canula is needed, which, when covered with gauze, shall be large enough to completely fill the trachea without unduly pressing on its wall.

Results of Operations.—*Mortality due to the Operation.*—In respect to this question the most valuable information may be obtained from the very complete tables of Hahn. In these tables there are seventy-four cases of excision of the entire larynx for new growths, but three of the seventy-four must be excluded from consideration, because the disease for which the larynx was removed was neither sarcomatous nor carcinomatous (tuberculosis, papillomata, and polypi). Of the seventy-one patients, twenty-five died within the first fortnight, and five within six or seven weeks after the operation. Death was due, in the very large majority of instances, to pneumonia or purulent bronchitis, and was not in any case due to recurrence of the disease. There appears, therefore, to be a mortality of about 40 per cent. directly due to the operation itself.

But this is only a partial statement of the actual facts. To obtain a more accurate knowledge of them it is necessary to consider separately the cases of sarcoma and of carcinoma ; for not one of the patients whose larynx was removed on account of sarcoma died. This may be of course a mere accident, and a much larger number of cases may give a very different result; but at present the fact must be taken as it stands.

There remain, then, sixty-five cases in which the larynx was entirely removed on account of carcinoma, and of these thirty were fatal from the immediate, or almost immediate, results of the operation—a very enormous mortality, which can only be justified by a brilliant success on the side of complete cure. Hahn points out, what indeed has already been noted by Schede, that the percentage of deaths due to the operation is somewhat less for the second half of the operations than for the first half, and attributes the improvement, no doubt correctly, to improvements which have taken place in the method of performing the excision, and to the manner in which the after-treatment is conducted. The difference is, that seventeen of the first thirty-two patients died, and thirteen of the second thirty-two.

With the exception of a very few persons who died of collapse, or hæmorrhage, or exhaustion, all of the deaths resulted from pneumonia, or broncho-pneumonia, or putrid bronchitis. It is only natural that the lungs and air-passages should be peculiarly exposed to inflammation after the removal of the larynx, on account of the direct entrance of air into the trachea. But the character of the inflammation betokens a very different origin. Both the pneumonia and the bronchitis are in the very large majority of instances undoubtedly septic. Several conditions probably combine to produce this liability to septic affections of the lungs: the operation is severe; the patients are often enfeebled, owing to the nature and long continuance of the disease; it is very difficult to keep the wound as perfectly aseptic as wounds can be kept in other parts of the body; and whatever precautions may be taken against the introduction of discharges from the wound into the trachea, a portion of the discharge is almost certain to find its way there. Nevertheless, the improvement which has taken place in the results of operations for the removal of the tongue, and the success with which similar causes of death have been combated, lead one to expect that care, and a determination to improve the methods of after-treatment especially, may produce better results in future, if it is considered desirable to perform the operation for carcinoma.

A study of the nine cases in Hahn's tables, in which only a partial excision was performed, may perhaps throw some light on the enormous mortality due to the major operation. In every one of them, one-half of the larynx was removed—in seven for carcinoma, in two for sarcoma; and only one patient died from the direct effects of the operation, a person who had made admirable progress until the twelfth day, when sudden and unexpected death took place, apparently from some unknown cause. Here, again, the number of cases is too small to admit of a comparison between them and the cases of removal of the entire larynx for carcinoma; but the difference is so striking that one cannot but draw from it the conclusion that the severity of the operation must have much to do with the greater mortality. To this, however, must be added the better position of the parts after partial excision, and the greater ease with which the patients can be fed, and no doubt the less extensive nature of the disease before operation.*

Cures due to Operation.—It will be convenient first to consider the sarcomas, on account of their small number and the ease with which an analysis may be made of them. We have records of six complete and two partial excisions for sarcomatous tumours. The further history of five of the six is known. Two died with recurrence of the disease—one at the end of seven, the other at the end of fifteen months. Of the remaining three, one was quite well and free from disease six years after the operation; the second two years after the excision; and the third died of phthisis a year and a half after the removal of the larynx, without any sign of recurrence of the disease. In these cases the operations had been very extensive, and had included the removal of parts outside the larynx as well as of the larynx itself. In the two instances in which the excision was partial, and concerned half the larynx, the result of one was, that the patient died ten months after the operation of inflammation of the lungs, or pleura, without any appearance of recurrence, although the operation included the removal of the side of the pharynx and base of the tongue. In the other case there was no recurrence some time after the operation, but the length of time is not stated in the table.

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* Since the above lines were written, three cases of partial excision of the larynx, performed in this country, have been published. The first operation was performed by Dr. Hahn himself, the second by myself, and the third by Mr. Lennox Browne. The two first cases were brought before the Clinical Society, were mentioned in the medical journals, and will be published in the *Transactions* of the Society; the third case was published in the *British*

Far otherwise are the results when we come to consider excision of the larynx for carcinoma. It has been already shown that thirty of the sixty-five patients for whom complete excision was performed died of the operation. Of the remaining thirty-five, twenty are known to have suffered from recurrence, and to have died within a few months of the operation. The duration of life varied from three to nine months, thirteen of the twenty dying within the first six months. There remain, therefore, fifteen patients to account for. In one case the further result was unknown; two patients died of pneumonia at the end of three and four months respectively, apparently in both instances without recurrence. In five of the remaining twelve cases, less than a year had elapsed between the operation and the last report. There are, then, seven patients alive without recurrence at periods respectively of fourteen, sixteen, sixteen, seventeen, eighteen, nineteen months, and four years. Even the most ardent admirer of active interference in cases of malignant disease can scarcely regard these

Medical Journal. All three of them were successful so far as the immediate recovery from the operation is concerned, and therefore bear out what has been said of the far less danger to life of partial operations. All three of them were cases of squamous-celled carcinoma (epithelioma) of intrinsic origin; and in all three the disease was of limited extent. Of the later results of the operations it is yet too early to judge.

results as satisfactory, for only one patient can be claimed as cured by the operation. The table of seven partial excisions, although it contains only one death which could in any way be attributed directly to operation, is not very attractive. Three of the six patients died of recurrence of the disease—one at the end of three, one at six, and one at seventeen months. There was no recurrence in the remaining three cases, but only fourteen months had elapsed in one, eleven months in the second, and an unknown time in the third.

It is only fair, in the consideration of these results of excision of the larynx for carcinoma, to say that there does not appear to have been any great care in the selection of fit cases for operation. The establishment of the diagnosis of laryngeal cancer seems in a large number of instances to have sufficed, and the patient was forthwith submitted to operation. Further, some if not many of the patients were greatly weakened by the effects of the disease, and were not fit to undergo even a gentle surgical operation, much less an operation requiring really a strong constitution. Better results may in future certainly be obtained by performing the operation with the help of Hahn's tube, performing a preliminary tracheotomy some days before the excision in those cases in which the patient is exhausted by long-continued dyspnœa, and feeding through a tube and funnel during the first days (or longer, if need be) after the operation.

And better results may, I am sure, be obtained, so far as the cure of the patient is concerned, by selecting cases of intrinsic carcinoma, and rejecting all cases, whether of intrinsic or extrinsic carcinoma, in which there is associated affection of the lymphatic glands. I am glad to find that these opinions are beginning to obtain a hold in this country and in the United States, and I shall look with the greatest interest to the next large table of cases of excision of the larynx, whether complete or partial.

Are patients who are not cured, relieved by the operation? This is a very important question, and deserves attentive consideration. It was discussed at some length in the section of Diseases of the Throat at the International Medical Congress of 1881. Indeed, the discussion on Foulis's and Schech's papers was commenced by Solis-Cohen in these words: "I am afraid that there is a tendency to the operation being overrated, if we do not appreciate the usually miserable conditions of the patients who have undergone it successfully, for there is an important difference between 'recovery' and mere 'survival after the operation.'" Morell Mackenzie also spoke of "the condition of a patient after extirpation of the larynx" as being "usually one of great misery." A great deal was said at that time of the distressing condition of an American patient who had undergone the operation, and apparently much more was made of this case than it merited. Towards the close of the discussion Lefferts referred to the case, and said that the "main reason for the patient's subsequent discomfort—not unusual, however, in like cases—was the impossibility of closing the large defect in the neck by any form of artificial apparatus, so as to permit of perfect deglutition. The moral effect of this operation was not so bad as has been represented; the patient lived cheerfully for some months, naturally, however, discouraged by a result (in deglutition) which he had hoped would be better. The older facts of the case are known to you. He did not, let me say, commit suicide." So far as I am aware, a more extended experience of the operation has rather led to the belief that the after-condition of those who have suffered extirpation of the larynx is not so bad as it was believed to be by most of those who took part in the discussion from which I have quoted. Nevertheless, there cannot be a doubt that it is not by any means satisfactory in cases in which there has been an extensive removal of the soft parts around the larynx.

In the first place, there is always the question, which can only be answered by a much larger experience, whether persons from whom the larynx has been removed are not more liable than others to pulmonary disease. One of the successful cases of excision for sarcoma died of phthisis a year and a half after the operation; a second terminated fatally from pneumonia a year after partial excision. Two of the patients for whom excision was performed for carcinoma died at the end of three and four months after the operation from pneumonia. My object in mentioning these cases is not to discredit the operation, but to draw attention to a result which may be exaggerated, but ought not to be overlooked.

So far as speech is concerned, a very fair result may be procured in cases in which even as much as half the larynx has been removed, without the necessity for the use of a mechanical contrivance. In cases in which the resection has been complete, the voice can be restored by the use of an artificial larynx; but I cannot say whether this is applicable to cases in which there has been a great loss of substance, and there is consequently a large gap remaining. The voice of the artificial larynx is of course monotonous, but it is clear and distinct.

The matter of deglutition is, perhaps, the most important. In cases in which only half the larynx has been removed the patient can not only swallow easily, but the act can be performed within a few days after the operation, provided the case is doing well and there are no complications. In cases in which there has been complete removal of the larynx, provided the operation has not involved to a serious extent the surrounding structures, particularly those at the back of the larynx, the patient may be able to swallow with little or no difficulty; but when there has been extensive removal of the surrounding parts, deglutition may be impossible without assistance, and the patient may need to be fed by means of a funnel and tube. This can certainly be done without difficulty, but it is not an agreeable task, and is very distasteful to the patient.

Conclusions.—Partial or complete removal of the larynx appears to be a suitable operation for cases of sarcoma. The more extensive the disease, and the more extensive, consequently, the operation, the less satisfactory is the result likely to be in every respect, not only with regard to the probability of recurrence of the disease, but on account of the after-condition of the patient.

Partial excision of the larynx for carcinoma has hitherto been practised very successfully so far as the immediate recovery of the patient is concerned. The condition of the patients after the operation has been very good. The cases, thus far, are too few in number to allow very decided deductions to be drawn from them; and the time which has elapsed since some of them were performed is too short to permit a decided opinion to be expressed regarding the permanent benefit which may be expected from the operation.

Complete excision of the larynx has hitherto been in every respect unsuccessful. The mortality due to the operation has been exceedingly large; and the remote results, so far as the cure of the surviving patients is concerned, have been surprisingly small. Moreover, the condition of many of the patients who were treated was not only not improved during the time they lived, but actually made worse by the operation.

Were it not that better results may be hoped for in future by better management of the patients during and after the operation, and by much greater care in the selection of cases, the operation must be condemned as unsurgical.

CHAPTER XVII.

THYROID.

The thyroid body may be the seat of carcinoma and sarcoma, but clinically, and so far as the question of operative treatment is concerned, I do not know that there is any essential difference between the two diseases. In both there is a probability that the lymphatic glands will be affected, and that the disease will be disseminated in other parts of the body. For our purpose, therefore, both diseases may be considered together under the common name of cancer.

With the exception of a certain number of recorded instances of congenital sarcomatous disease of the thyroid, cancer of this organ is a disease of adult age, and occurs more frequently after forty years of age than in earlier life. It attacks men rather more frequently than women, probably in about the proportion of five to four; a very singular circumstance when the far greater liability of women to simple enlargement of the gland is remembered, and the further circumstance that certainly many of the cancerous affections have been noticed in glands which have during some years been the seat of simple enlargement. The history is not at all uncommon, that the patient had suffered from goitre for years, that the goitre had very slowly increased or been actually quiescent, that suddenly rapid growth had taken place, and the case terminated fatally in the course of a few weeks or months. The disease often produces general and almost uniform enlargement of the whole gland, and resembles in this respect the cancerous affections of the liver and the testis; but it may form a distinct and clearly defined tumour, which may be situated in the isthmus or in either lobe. As the disease advances the natural outline of the thyroid is lost, and an irregular mass, which may be of large size, but is not by any means invariably so, occupies the position of the gland, and welds it together with the surrounding structures. Sometimes separate nodules can be distinguished on either side of the neck, which may be affected glands or secondary growths in the tissues external to the thyroid. These masses soon become attached to the primary disease, which, if it was formerly movable, is now firmly fixed. Its surface may become bossed or tuberose. At a later period the skin often becomes reddened and adherent ; soft spots may be observed, the redness over them leading to the impression that the affection is inflammatory. A puncture results in the escape of a small quantity of thick semi-fluid material, and is frequently followed by fungous protrusion of the tumour. Pressure is exercised on the air and food passages—more on the food than on the air passages in the majority of instances, at least in the earlier stages of the disease ; and dysphagia and dyspnœa result. The trachea and œsophagus may be thrust out of their natural line, and ingrowths of the cancer may produce such a degree of stenosis, and of such a character, that the introduction even of a catheter may be impossible. This accounts for the very small advantage which has resulted from tracheotomy performed for the relief of persons suffering from cancer of the thyroid, even when a long flexible tube has been employed. The carotid arteries, the jugular veins, the laryngeal and other nerves are liable to become involved in the growing mass, to such an extent that it may be impossible to liberate them by dissection. Secondary affection may take place of the lymphatic glands, the lungs, the brain, bones, kidneys, and other tissues and organs.

It is very difficult to form a correct estimate of the natural duration of the disease—not on account of the frequent interruption caused by operations, but because of the many instances in which malignant disease has been engrafted on simple enlargement of the thyroid. Edmund Rose calculates it at from six to eight months, the extremes being nine weeks and a year and a half. If this estimate is correct—and there seems to be fair reason to accept it—malignant disease of the thyroid is among the most malignant of all cancerous diseases; for even in cases which have been fatal from suffocation within six months of the apparent commencement of the disease, secondary affection of many parts of the body has been found, while other cases have been fatal in a shorter period by reason of these secondary tumours. The causes of death are various : some of the patients die of suffocation, some of suppuration and gangrene, some of exhaustion and the production of the cancerous cachexy.

On the question of diagnosis I shall have a word to say presently, when the operative treatment of the disease is analyzed.

Methods of Operation.—The extent of the operation and the lines of incision will naturally be determined by the extent of the disease; particularly will this be the case when the tumour is circumscribed, and only occupies a limited part of the thyroid body. It is impossible to describe all the modifications of the operation of thyroidectomy which may be suitable for individual instances, and I shall therefore describe the operation for the complete removal of the thyroid body, and shall only shortly advert to the modifications which may be made in particular instances.

The operation of splitting the capsule of the thyroid, and scooping or scraping the tumour out of its interior, is not applicable in the very large majority of cases of malignant disease, on account of the extremely firm consistence of many of the tumours, the close adherence of the tumour to the capsule of the gland, and the fact that in some or many instances the disease has extended beyond the capsule, and has infiltrated the surrounding structures. Indeed, this method of removing even non-malignant enlargements of the thyroid has fallen of late years very greatly into disuse, on account of the hæmorrhage which is associated with it, and the much better prospect of a good result when the disease is removed without opening the capsule, except at the point where it is determined to cut through the goitre.

The patient having been prepared in the usual manner for operation, and the integuments of the neck thoroughly soaked in carbolic or some other antiseptic solution, ether or chloroform is administered: chloroform is to be preferred on account of the smaller tendency to cause congestion of the vessels of the head and neck. The shoulders of the patient are raised, the head thrown back so as to expose and throw into relief as much as possible of the front of the neck, and especially to raise the tumour as high as possible above the sternum. An incision is made from the sternal notch up the middle line as far as the upper border of the tumour, and then up the side of the neck towards the angle of the jaw, or rather to a point about an inch below the angle. If a second similar incision is made on the opposite side of the neck, the three incisions form a Y shape. The oblique incisions can be prolonged as far as is necessary to obtain a thorough exposure of the disease. Usually they reach up to, but not beyond, the anterior margin of the sterno-mastoid muscle. In these incisions the skin and subcutaneous tissues, including the platysma and veins, are divided, and the veins are at once ligatured. In consequence of the extensive hæmorrhage which may take place in the deep dissections, it is advisable to place a double ligature round each vein, and cut between the ligatures. The sterno-hyoid, sterno-thyroid and omo-hyoid muscles will almost certainly require to be divided, and it may be necessary also to divide one or both sterno-mastoid muscles either wholly or in part. If the muscles are not adherent to the tumour, the latter will be fully exposed by their division. Its surface is usually covered by large veins, which freely anastomose, which are very thin-walled, and bleed abundantly if they are wounded. The utmost care must be taken to ligature them one by one at the borders of the tumour, applying a double ligature to each, and cutting between the ligatures until the surface of the tumour is cleared. The superior thyroid artery is then sought for at the upper extremity of the wound close to the margin of the tumour, and cautious separation of the adjacent structures, if they are not infiltrated with the disease, will enable the operator to discover and ligature it. The inferior thyroid artery is ligatured in the same manner, but with greater precautions in separating it thoroughly from the surrounding structures on account of the danger of applying a ligature to the recurrent laryngeal nerve. Instead of dividing the trunk of the inferior thyroid artery just above the seat of ligature, it has been recommended by Baumgartner that the ligatures shall be applied at some distance from the lower border of the tumour, and that the branches of the artery shall be cut through just as they enter the tumour, for there is thus less likelihood of injuring the recurrent laryngeal nerve. The lateral portion of the tumour is now separated as thoroughly and as gently as possible from the surrounding and subjacent structures, and gradually turned up towards the middle line. The same method may be pursued in dealing with the other lateral lobe, or it may be separated by pursuing the dissection from the middle line on the under aspect of the tumour. The vessels are of course dealt with separately, and in the same manner as those on the side first attacked. In this manner the entire tumour is removed, and if great care has been expended on the preliminary ligature of the vessels, a severe hæmorrhage need not be apprehended in the cavity left by the extirpation of the diseased mass. The wound is examined in every part, and every bleeding point is secured; it is thoroughly cleansed with antiseptic solution; drainage tubes are inserted; its edges are brought together with sutures; the surface covered by Listerian or other antiseptic dressing, according to the preference of the operator; and the patient is put into bed, care being taken to keep the head fixed by means of a sand-bag or some equally efficient apparatus.

Beyond strict antiseptic dressing of the wound, no special care is required after the operation, unless it be to keep the head still until the healing is sufficiently advanced to render this precaution unnecessary. Nourishment can be taken by the mouth, and there is no difficulty in the breathing in uncomplicated cases.

The operation, as it is described above, appears to be straightforward, and not very difficult to perform. The wound is sufficiently large to allow the thorough exposure of the disease ; the bleeding, though free, can be controlled even before the vessels are cut ; and the dissection, though undoubtedly deep, may be carried out successfully with care. Yet even these uncomplicated tumours can only be removed with difficulty. Mac Cormac (*British Medical Journal*, 1884, ii. 229), speaking of the removal of a non-cancerous goitre with no worse complication than the large size of the tumour, says it involved one of the most difficult and serious operations he ever had occasion to perform. No fewer than 100 ligatures were applied, and the operation lasted two hours. The cancerous tumours are for the most part infinitely more difficult to remove ; they are often of large size, bleed as readily as the simple goitres, and are so adherent and involve so many important structures that the operation for their removal is one of the most difficult in surgery.

In the first place, the cancer may be adherent to the larynx and upper portion of the trachea, and the removal can perhaps only be accomplished by resection of a part of these structures. Under these circumstances the low operation of tracheotomy is required, and Trendelenberg's or Hahn's tube must be employed, to prevent the entrance of blood and other liquids into the lungs. Bircher has described (Volkmann's *Sammlung*, No. 222, 1882: "Die malignen Tumoren der Schilddrüse") an operation of this magnitude which ended fatally in the course of a few days. In the same manner it may be needful to resect a portion of the œsophagus. The great vessels of the neck may be so implicated in the growth that it can only be taken away after they have been ligatured above and below, and cut away between the ligatures. The pneumogastric nerve may meet with the same fate of division or resection. The removal of portions of the surrounding muscles seems, after such occurrences as these, a very trivial matter. Instead of being enclosed in a capsule, the disease may be, and frequently is, so ill-defined that it is very difficult to be sure of its limits.

During the course of the operation the lymphatic glands may be discovered to be enlarged and cancerous. If they are within reach of removal, they must be dissected out; if they are too widely scattered or too adherent, the operation may be abandoned, or the thyroid tumour may be removed, and the glands left behind: a hopeless procedure except for the relief of urgent symptoms of suffocation.

As an indication of the difficulty which may attend the removal of a malignant tumour of the thyroid, I cannot do better than quote part of the description which Billroth gives of a case in which he removed a tumour the size of a hen's egg, immovably connected with the trachea (*Clinical Surgery,* 168: New Sydenham Society, 1881): "I extirpated the tumour, and found the operation one of the most difficult which I have ever performed. There was great difficulty in separating the tumour from the trachea and the deeper parts, the hæmorrhage was very severe, and attacks of suffocation occurred, and she seemed several times during the operation on the point of death from asphyxia." Yet this case does not appear to have been one of the worst of those which have been dealt with by operation; indeed, with the exception of the adherence to the trachea, it might have been regarded as a peculiarly favourable case for operation.

Results of Operations.—Very excellent information on this subject is afforded by three papers in three volumes of Langenbeck's *Archives*, xxiii. (1879); xxviii. (1883); and xxxi. (1885). The first is by Dr. Edmund Rose, the second by Dr. H. Braun, the third by Dr. J. Rotter. They may be regarded as supplementing each other, so far as the diagnosis and treatment of cancerous disease of the thyroid is concerned. The total number of instances of removal of the disease in the third paper is fifty, of which thirty-four had been collected by Braun and sixteen by Rotter. Thirty of the fifty patients died of the effects of the operation, a mortality therefore of sixty per cent. The fatal issue took place in the first twenty-four hours after the operation in eight cases, in from two to four days in ten cases, in from four to nine days in five cases, in from one to eight weeks in five cases. In two instances the exact period of death is not mentioned. The causes of death were in many of the cases, not single, but multiple. For instance, dyspnœa, collapse, and the presence of secondary disease—pneumonia, mediastinitis, and enlargement of the bronchial glands (either cancerous or not)—combined to produce death. The immediate deaths took place almost wholly from the severity of the operation, and those which occurred within two to four days after the operation were attributable to mediastinitis and septic poisoning. In two or three cases severe secondary hæmorrhage occurred, and proved fatal.

Two circumstances are particularly worthy of notice—the large number of instances in which secondary affection was discovered at the autopsy, even when death occurred within a few days after the operation, and the frequency with which it was found impossible to entirely remove the tumour. These circumstances are the more extraordinary and the more significant in respect to the question of extirpation when it is taken into account that many of the cases were selected because they appeared to be far better fitted for the operation than most cases of malignant disease of the thyroid gland. It must be apparent to every surgeon who considers these matters that the attempt at radical cure was delayed until too late in the course of the disease, and this impression will be confirmed when we come to consider the further history of the cases in which recovery from the operation took place. Then follows the question: Why, knowing the necessity for early operation, was the operation deferred until the primary disease had become adherent to and involved vital structures, and until secondary disease of the lymphatic glands, the lungs and other parts of the body, was present? Braun has laid down very clearly and emphatically the conditions which are favourable to an attempt to remove malignant disease of the thyroid. The tumour should be movable and completely encapsuled, its lower limit should be above the sternum, the pulsation of the common carotid artery should be perceptible on its external surface, and there should be no affection of the glands or metastases. But, he adds—and in this lies the whole gist of the matter—tumours of the thyroid in which the circumstances are so favourable are scarcely to be recognized as malignant new growths. The difficulty of diagnosis is indeed the great obstacle to the prospect of successful extirpation of cancerous disease of the thyroid. Rose considers the two most reliable symptoms of the disease to be continuous growth and marked dysphagia. Curiously enough, however, he points out that the surgeon is liable to be deceived on the subject of continuous growth by the effect of remedies. Iodide of potassium, which is frequently employed against cancerous enlargements, may cause a diminution in the size of the neck ; and this he attributes to the effect of the drug on the general enlargement of the gland which is frequently associated with the occurrence of more or less limited malignant disease. So exceedingly difficult is the diagnosis of malignant disease of the thyroid in an early stage, at a time when removal might not unreasonably be expected to be successful, that Braun says : "Wie mir scheint, werden wir niemals im Stande sein, die fruhen Stadien maligner Strumen zu diagnosticiren." Under these circumstances one cannot be surprised to learn that some of the most successful cases have been those in which a malignant tumour was removed under the impression that it was an innocent disease. Even under such apparently favourable conditions the operation has been attended with the greatest difficulty, as for example in the case described by Billroth, from which a quotation has been given, where the disease was thought to be a calcifying innocent tumour in a woman twenty-eight years old.

Is the disease curable by operation? In the twenty cases which remain after deducting thirty fatal cases from the fifty which were treated by operation, there were two in which the operation was not completed, and which really should be left out of the account, except in so far as the fact should be mentioned that it was found necessary to abandon the operation in a certain number of instances. In three cases the further history was not known, and in one case the further observation only extended to a period of two months after the operation. In ten cases there was recurrence, which was either fatal or promised rapidly to be so. Only in four instances was a favourable result obtained. One of these was a patient, treated by Bircher, who was known to be alive and well eleven months after the operation. The second was operated on by Bruns ; some enlarged glands were removed a year after the first operation, and two and a quarter years later the patient died of inflammation of the lungs. The third case is one of Maas,' and was reported to be quite well nearly four years after the operation ; and the fourth patient, also under the care of Maas, died at the end of twelve months of some affection of the lungs of uncertain nature.

The fifty cases collected by Braun and Rotter do not comprise all the cases in which removal of the thyroid gland has been practised for cancerous disease, but they certainly comprise the greater number of them, and are, I think, fairly representative of the condition of surgery in relation to this operation. In the *Gazette des Hôpitaux*, Nov. 29, 1884, is an account of the extirpation of an enormous sarcomatous tumour of the thyroid, followed by complete absence of disease for more than three years, then by recurrence in the scar, which was removed with good result. There is also the description in *La France Médical*, Dec. 13, 1884, by Marchand, of a case of carcinoma of the thyroid, in a woman thirty-two years old, in which the patient was quite well and free from disease sixteen months after the operation. If, however, all the cases which have been overlooked by the three German authors, or which have been published since the publication of Rotter's paper, were collected and analyzed, I am afraid the results would not be better than those which appear in his list. At least four-fifths of the cases in Braun's and Rotter's lists were treated within the last ten years—within the period, therefore, of modern antiseptic surgery. The statistics of operations for the removal of innocent tumours of the thyroid have improved steadily with improved surgery, but the same statement cannot be made with regard to the statistics of extirpation of cancerous tumours of the thyroid. Braun particularly draws attention to this, showing that the dreaded inflammations of the tissues of the neck and mediastinum only exceptionally occur, and that the real difference lies in the local relations of the malignant tumours, in the frequent affection of the cervical, mediastinal, and bronchial glands, in the metastasis in different internal organs, in the great difficulty in the diagnosis of malignant thyroid tumours generally.

Conclusions.—The operation for the removal of malignant disease of the thyroid is a very fatal operation, and is likely still to be so, on account of the conditions of the disease which have been noted, unless the removal is undertaken at a very early period of the disease.

At present there are no means by which we can determine the diagnosis of malignant disease in its earliest stages.

The number of instances in which a cure of the disease can be claimed is so small that the operation is scarcely justified by it.

If further experience of malignant disease of the thyroid enables us to diagnose it at a much earlier period than we are able to do at the present time, the question of its removal by operation may be reconsidered.

CHAPTER XVIII.

ŒSOPHAGUS.

SARCOMA of the œsophagus is a very rare disease, but carcinoma is not at all uncommon. Probably at least 90 per cent. of all the cases of œsophageal carcinoma are cases of squamous-celled carcinoma (epithelioma), and this will not surprise any one who takes into account the nature of the mucous membrane of the gullet and its resemblance to the mucous membrane of the tongue. The disease may attack any part of the tube, from the termination of the pharynx down to the stomach, and while it is unusual in the central portion, occurs with almost equal frequency in the upper and lower halves. Ulceration takes place at an early period, and stricture is produced, for the growth quickly spreads round the circumference of the tube. Moreover, it extends in many instances quickly along the wall of the œsophagus in a vertical direction, both upwards and downwards, so that from one to two or several inches of the long axis may be affected; and, still further, it penetrates the thickness of the œsophageal wall, and early affects the surrounding structures, gluing them to the œsophagus, and often eating deeply into them. In this way the larynx and trachea, the bronchi and lungs, may be implicated, and masses of disease may be formed in the mediastinum. The lymphatic glands are affected in a very large number of instances, usually the glands which lie close to the œsophagus on a level with the epithelioma; but in some rarer cases glands situated at a distance of from two to four inches are cancerous. Secondary affection of other organs and tissues is not usual; but cases are recorded in which generalization has taken place in the liver, the lungs, the bones, skin, &c.

The disease is essentially, for a considerable period at least, a local disease, resembling in this respect epithelioma of the lower lip and tongue, eating its way along, into, and through the wall of the œsophagus, invading the structures immediately adjacent to the œsophagus, and affecting the neighbouring lymphatic glands.

It is not necessary separately to consider the other varieties of cancer which attack the œsophagus, for, with the exception that the scirrhous tumours usually run a slower course, and the soft carcinomas form larger growths, there is no essential difference between them from the point of view in which we are here interested—the possibility of radical surgical treatment.

Cancer of the œsophagus is a disease of adult age, becoming proportionally more frequent with advancing age, and very seldom attacking persons under thirty years old. It is much more frequent in males than females, resembling again in this respect cancer of the lip and tongue. It is invariably fatal, unless the patient is carried off by some intercurrent malady, and the fatal termination is seldom deferred for more than a year or a year and a half; while in many instances, perhaps the majority, death takes place within six months of the first appearance of symptoms. The sufferers gradually waste and fade and die, sometimes suffering much pain in the later stages of the disease, but more often little pain, although there is great distress from hunger, dyspnœa, and other causes.

Methods of Operation.—In accordance with the rule I have prescribed to myself, I shall limit the question of treatment to operations intended to *cure* the disease. So far as I am aware, only one method of operative treatment has been employed to this end; that, namely, of excision of the cancerous portion of the gullet.

Excision of the Œsophagus (*Œsophagectomy*), first suggested by Billroth, who performed the operation experimentally on dogs, was attempted on two occasions, in 1875 and 1876, on the human subject by Kappeler, but was first carried out successfully by Czerny in 1877. On this account, and because the operation performed by Czerny has been practised, with slight modifications, by all those who have excised the upper part of the œsophagus, I shall avail myself of his description (*Beiträge zur operativen Chirurgie*, s. 48, 1878).

The patient having been placed thoroughly under the influence of chloroform, and the head thrown back and turned towards the right side, an incision was made along the anterior border of the left sterno-mastoid muscle from the level of the hyoid bone almost down to the border of the sternum. The omo-hyoid muscle, which lay right across the wound, was divided. The thyroid gland and the superior thyroid artery were drawn aside out of harm's way. It was then possible to feel an induration in the wall of the œsophagus, which lay behind the larynx and was not adherent to it, but freely movable from side to side. The affected part of the œsophagus could be clearly separated from the surrounding parts above and below so that the possibility of completely removing the cancerous mass was made certain. It was cleared from the adjacent textures, the bleeding vessels were tied, and the œsophagus was cut through above about the line of junction with the pharynx and below at the lower border of the larynx. The bleeding vessels in the wall of the tube were secured, and the stomach end of the divided tube was fastened to the wound in the skin by means of eight sutures, as it was unfortunately found to be impossible to bring together the upper and lower segments. A soft catheter, with a very large lumen, was passed, through which food might be introduced; the wound was washed with a solution of 5 per cent. of chloride of zinc, closed with sutures, after two drainage tubes had been placed in it, one at the upper, the other at the lower end, and finally covered with salicylic wool and a compress.

The excised portion of the œsophagus measured six centimetres long and included the whole circumference of the tube. The disease proved to be epithelial cancer.

The case, in this particular instance, appears to have run a most favourable course; neither the wound nor the general condition of the patient ever gave rise to the least anxiety. During the first few days the catheter was retained in the œsophagus, but at the end of a week it was only introduced when it was necessary to feed the patient.

No important modifications have been made in this method of operating in the few cases in which excision of a portion of the œsophagus has been practised. The same incision has been usually if not always employed, and, through it, affected lymphatic glands have been removed as well as the diseased piece of the œsophagus.

It is of course evident that excision is only practicable in the case of malignant disease situated quite at the upper end of the œsophagus, and no attempt has yet been made to remove cancer of the middle or lower portions of the tube.

Results of Operations.—It is obvious that the operation of excision of a portion of the œsophagus is applicable only in very exceptionable cases of cancer. For example, the disease must be situated only just beyond reach of the finger introduced through the mouth and must not extend beyond the junction of the first and second portions of the tube; there must not be any affection of the lymphatic glands; the cancer must not have spread deeply beyond the wall of the œsophagus or have contracted adhesions to the surrounding parts. In spite of the admiration which the account of Czerny's successful operation excited and the energy which is at present displayed in seeking out and executing very extensive and dangerous operations for cancer I cannot discover that œsophagectomy has been performed more than six times. Last year Gross published a paper which can be found in the *Transactions of the American Surgical Association* (vol. ii.), on "The Treatment of Stricture of the Œsophagus," in which he mentioned the only cases which he could find on record of the operation of resection of the œsophagus. They were five in number, including Czerny's case. Two of the five died from causes directly connected with the operation; von Bergmann's patient (*Deut. med. Wochensft.* ix. 608; 1883) in four-and-twenty hours from purulent œdema, emphysema, pneumonia and pericarditis; Israel's patient on the seventh day from pneumonia and gangrenous inflammation of the neck. A third patient, Billroth's, was killed by the passage of a bougie into the tissues around the œsophagus; the instrument was rendered necessary by the contraction of the opening where the lower end of the œsophagus was fastened to the integument, and the fatal result occurred in the course of the sixth week. The fourth of the five patients was alive and well at the end of seven weeks; and the fifth of the series is Czerny's patient. This woman, who was fifty-one years old, had suffered from symptoms of stricture of the œsophagus for about five months at the time the operation was performed. The disease could be felt with the finger from the mouth and there did not appear to be any enlargement of the lymphatic glands. The operation was performed in the manner described in the last section. She made an excellent recovery and came five months later to report herself as quite well, at work in the fields and able to feed herself comfortably through the funnel and tube.

I can only add one case to those which have been put together by Gross, thus making six cases in all. The operation was performed by Sonnenburg (*Deut. med. Wochensft.* x. 459; 1884) on a woman, fifty-four years old. The disease was to all appearance successfully removed, although it had grown into the larynx; the woman made a good recovery, and was well three weeks after the operation.

Of these six cases, therefore, three resulted in death from causes directly or indirectly connected with the operation and three survived. The further history of two of the patients who recovered can be traced, and offers little prospect of permanent benefit from operation. Morell Mackenzie (*Diseases of the Throat and Nose*, ii. 99, footnote), says that, in a private letter to himself, Professor Czerny tells him that the woman who was well at the end of five months died rather more than a year after the operation. Recurrence of the disease took place to an extent which rendered tracheotomy necessary, and the patient succumbed some weeks afterwards. Sonnenburg's patient is reported by the operator (*Verh. Berliner med. Gesellsft.* xvi. i. 169), to have suffered from recurrence about four weeks after the operation. Tracheotomy became necessary, and in the course of the same year in which the operation of œsophagectomy had been performed, she died.

In addition to the cases in which the resection has been carried through there are other cases in which it has been attempted and abandoned on account of the impossibility of removing the affected portion of the œsophagus, or because extensive glandular disease was discovered when the dissection had been carried sufficiently deep to expose the parts around the œsophagus. Both Kappeler and Sonnenburg have described such cases in their practice, and it is not improbable that many more of them have occurred than have been published, for there is not so much inducement to publish an unsuccessful attempt to perform an operation as there is to publish a completed difficult operation, even when the result has not been fortunate.

The cases which have been recorded show that the operation of œsophagectomy has at present obtained no *locus standi*, and a study of the course and natural history of cancer of the œsophagus will go far to convince most surgeons that there is little prospect of our being able to perform it unless in very exceptional instances. Even in the most favourable conditions, such as those which surrounded Czerny's case, the result was not sufficiently enduring to encourage a repetition of the operation.

CHAPTER XIX.

PYLORUS.

THE frequency with which the pylorus is the seat of malignant disease is well-known, but I am not aware of any large statistics or collection of cases which tell of the relative frequency with which it is attacked by carcinoma and sarcoma, or indeed of any large number of instances of sarcoma. Still less am I aware of any means by which carcinoma of the pylorus can be distinguished from sarcoma or one kind of carcinoma from another. Although, therefore, the pylorus is subject to hard and soft carcinoma, and is occasionally the seat of colloid carcinoma, it is not needful for the purpose we have in view to give a separate account of these diseases. I cannot say that in the future such an account, drawn up with great care, may not be of service from an operative point of view, but at present we possess no sure means of distinguishing one variety from another during the life of the patient, and it is our business to examine the relation of operative surgery to cancer of the pylorus as the recorded cases exhibit it.

The tables drawn up by Gussenbauer and von Winiwarter (Langenbeck's *Archiv*, xix. 372 ; 1876), afford admirable material for the general study of the disease in post-mortem examinations. In the 61,287 post-mortem examinations presided over by von Rokitansky between 1817 and 1873, these authors found records of 903 cases of cancer of the stomach, which included 542 cases of cancer of the pylorus. I need not give the exact numbers of the cases in which adhesions of the pylorus to adjacent organs were discovered, or in which there were no adhesions, or the exact number of instances in which secondary affection of the lymphatic glands and other organs and tissues was present. The principal points of interest to us are that cancer of the pylorus is in many instances for a long time limited to the pylorus itself, and may even remain so up to the time of death. It is, however, prone to form adhesions to neighbouring organs, particularly the pancreas, liver, and transverse colon. And not only are the lymphatic glands liable to secondary affection, but secondary growths may occur in the liver and other organs and tissues. It is possible in some cases to discover whether the pylorus is free from the surrounding structures by its free mobility, and the fact that it hangs lower down in the abdomen than its normal position. But this sign cannot be absolutely relied on, as the cases in which resection has been practised or attempted show, and there are no sure signs by which the presence or absence of affection of the lymphatic glands and other tissues can be discerned. Hitherto the operation of resection for carcinoma has been performed in cases in which a distinct tumour has been felt in the abdomen in the situation of the pylorus or below it, in which the tumour has been freely or fairly movable, and in which there has been no sign from which it could be inferred that there was secondary affection of any internal organ or tissue.

Cancer of the pylorus appears to attack men rather more frequently than women, and is distinctly a disease of adult age, rarely occurring in persons of either sex under thirty years of age, but from thirty onwards becoming more frequent until sixty years are past, when the total number of cases begins to decline, but the proportionate number probably remains the same or even increases. The tumour at the exit of the stomach gradually produces symptoms of stenosis, but complete obstruction rarely occurs. Pain at the epigastrium, vomiting, and emaciation, draw the attention of both the patient and the medical man to the seat of the disease, and at the present time the diagnosis is usually made at a tolerably early period of the malady.

Methods of Operation.—On account of the frequency with which the operation of resection of the pylorus has been practised by Billroth and his assistants, I have taken the details of the operation itself, and of the preliminary and after-treatment from Woelfler's and Hacker's monographs, in which all the pylorus resections which have been performed in Billroth's clinic are described.

Preparation for the Operation.—When a patient is destined for operation, it is thought desirable to estimate, as far as possible, the capacity of the stomach, and for this purpose bitartrate of potash and carbonate of soda are administered. The carbonic acid produced by the combination of the salts causes distension of the stomach with gas, when percussion easily estimates its capacity. A very dilated stomach is, if not a contra-indication to the operation, a source of great danger; nutrition is interfered with, vomiting takes place, and there is great probability that the patient will sink from exhaustion and inanition.

For several days before the operation, and a couple of hours preceding it, the stomach is thoroughly washed out with tepid water; a very disagreeable process, but almost essential to the safety of the operation.

Great attention is paid to the food which the patient can best tolerate, so that he may be fed with that food for the first few days. And, lastly, the bowels are thoroughly emptied, the extremities are kept covered with warm flannel, and the temperature of the room is raised to about 65° or 70°—precautions which are usually taken in the performance of laparotomy.

The Operation.—An incision is made over the tumour (unless it has sunk down some distance towards the umbilicus). The direction of the incision may be transverse or vertical in the linea alba. The transverse incision is, I think, gradually falling into disuse on account of some greater advantages which the vertical incision undoubtedly offers. Thus, it is far more easy to close a vertical than a tranverse incision in the abdominal wall; the vertical incision is more convenient and less serious if examination proves that the resection cannot be proceeded with; and the time required for closing a vertical incision is shorter than that needed for suturing the transverse incision, a point of importance when the length of time consumed in many of the resections, and the exhausted condition of the patient, are considered. The bleeding from the edges of the wound is carefully arrested before the peritoneum is opened. After the opening of the peritoneum, a thorough examination is made of the extent and nature of the disease, particularly with respect to its relation to surrounding structures, of all others the pancreas and transverse colon; and the operator decides whether to proceed with resection or to abandon it.

Now follows one of the most difficult parts of the operation, the separation of the pylorus from the parts with which it is naturally and abnormally connected. The great omentum is detached from the greater curvature of the stomach; the layers of the omentum are taken up piece by piece between clamp-forceps, ligatured and cut through. The lesser omentum is treated in the same way. Enlarged glands in the omenta are removed. During this part of the operation, and indeed throughout, the portion of stomach which is to be removed is kept covered with cloths which have been soaked for a fortnight in a 5 per cent. solution of carbolic acid, and finally wrung out in warm thymol solution. After the stomach has been isolated, a large flat disinfected sponge or cloth is laid beneath it; this is a valuable precaution, not only to enable further manipulations to be carried out more easily, but to catch any of the contents of the viscus, if by evil chance they should escape when the incision is made.

The direction of the incisions for the removal of the cancerous parts varies somewhat according as it is intended to fasten the duodenum to the upper or lower curve of the stomach. In the former case the direction is from above downwards, inclined from right to left. In the latter case it is inclined from left to right. The walls of the stomach are cut through with scissors, and at each cut the bleeding vessels are secured. If the stomach contains any food or liquid, this must be soaked up with a sponge. The vessels are ligatured with very fine antiseptic silk, and before the separation of the disease from the intestine, the cut edges of the stomach are united in such a manner that the serous coats are brought together, except at the part where it is intended to attach the duodenum. The disease is again seized with vulsellum forceps, drawn down, and the duodenum cut through in the same manner and direction as the stomach. Before the division is completed, it is well to pass two or three threads through the upper and front part of the duodenum in order to enable the operator to control it in case it should be inclined to slip away.

The disease having been completely removed, and the parts in the neighbourhood having been examined for separate nodules or enlarged glands, the duodenum is attached to the stomach. The manner of applying the sutures is as follows:—They are passed from within the bowel and stomach. The needle is inserted between the mucous and muscular coats, carried through the muscular and serous, then through the same layers of the duodenum, and finally brought out between these layers and the mucous membrane at the cut edges. By this means a considerable breadth of the serous coat of each part is set in apposition. An occasional suture may also be inserted to bring together the edges of the mucous membrane, and ensure the continuity of the interior of the canal; although this is scarcely necessary on account of the manner in which the cut edges of the mucous membrane naturally fall into adaptation when the outer coat is sutured. In all these sutures, those of the outer, as well as those of the inner row, the knots are directed towards the interior of the canal. During the passage of the sutures and the application of the two portions of the alimentary canal to each other, the parts are held by the fingers of an assistant. Various forceps and other instruments have been employed for this purpose, but the fingers of a trustworthy assistant are found to be as effectual as any instrument in maintaining the parts in position and apposition, and in preventing the escape of the contents of the stomach and intestine into the abdominal cavity. They are, too, far less likely to cause sloughing or other damage to the delicate structures which they embrace.

In sewing up the stomach, care should be taken to avoid the formation of any folds. The material for sutures may be carbolized silk or catgut, but the former is generally preferred, as being less likely to give way at too early a period, before the union between the serous coats is sufficiently strong to bear the strain which must necessarily fall upon it.

It should have been mentioned, when speaking of the actual resection of the diseased portion, that when it is intended to attach the duodenum to the lesser curvature of the stomach, the incision through the walls of the stomach should be made from below upwards, and the threads should be passed before the section is complete, also from below upwards. When, on the other hand, it is determined to fix the duodenum to the greater curvature, the section of the stomach should be made from above downwards, and the opposed surfaces of the stomach should be united or ready furnished with threads before the section is complete.

After careful cleansing of the interior of the abdomen from blood and such contents of the alimentary canal as may by mischance have found their way into it, the edges of the opening through the abdominal wall are united in the same manner as after the operation of abdominal section or ovariotomy. If the transverse incision has been used, it may be needful to employ lead button sutures in order to bring the parts more thoroughly and firmly into apposition. The dressing of the wound is such as the operator prefers.

It need scarcely be said that the operation of resection of the pylorus occupies necessarily a long time, often two, and sometimes as long as three, hours. This length of time, during which the patient is under the influence of anæsthetic and the abdomen is open, adds largely to the danger in the case of persons who are usually exceedingly emaciated and weakened by the disease, from which they have been probably suffering for several months. With a view to shorten the duration of the operation, continuous sutures have been used for the closure of the stomach and the attachment of the stomach to the duodenum. But they are generally objected to on the ground of being less reliable than interrupted sutures. They are not so successful in bringing the serous surfaces closely in apposition at all points, and are more likely to give way, and to cause folding or puckering of the stomach.

In the *after-treatment*, two circumstances deserve to be kept particularly in mind :—First, that the patients are almost always exceedingly debilitated at the time of the operation ; second, that they do not usually thrive when fed by the rectum, for the rectum does not satisfactorily retain the nutrient injections which are given. There might naturally be an inclination to give ice by the mouth, in order to allay the inflammation which might be expected to follow such rough treatment of the contents of the abdomen ; and it is only reasonable to suppose that as long a period as possible should be allowed to elapse before the introduction of food (of whatever kind) into the stomach. But in spite of *a priori* reasoning, there can be little doubt, from the experience which has been gained now in a large number of cases, that the earliest and best feeding by the mouth which the patient can take affords the best chance of recovery. No definite rules can be laid down with regard to the kind or amount of food which should be administered ; but, in all probability, the food which the patient could best tolerate before the operation will be the most useful during the first few days after it, and it is for this reason that the recommendation has been made that great care should be taken in the stages of preparation to discover the variety and form of food which suits best each individual patient. The attempt may of course be made to feed by the rectum, but the surgeon must not be disappointed if it does not meet with success.

If the patient survives, the management of the wound does not usually give rise to any difficulty. It is dressed in no other way, and neither more nor less frequently, than similar wounds made in the abdominal wall for other surgical purposes. The kind of dressing and the manner of applying it, as well as the frequency with which it is changed, may be left to the operator.

Results of Operations.—*Mortality of the Operation.*—The largest published statistics of which I am aware are the tables in Winslow's paper in the April number of the *American Journal of* *the Medical Sciences for* 1885 (new series, lxxxix. 345). He has there collected sixty-one cases of resection of the pylorus, of which fifty-five were cases of cancer. We have nothing to do with the six cases in which the operation was performed for cicatricial stenosis or for simple ulcer, and our attention may therefore be wholly concentrated on the cases of carcinoma. Of the fifty-five patients, forty-one died of the effects of the operation, thirteen recovered, and the result is not mentioned in one case. The percentage of deaths is thus nearly seventy-six. Nor does there appear to be any decided improvement if a larger number of cases is taken. For Kramer of Göttingen, in his review of Winslow's paper in the *Centralblatt für Chirurgie* (1885 ; 548), says that he has a table of seventy-two cases of resection performed for cancer, that fifty-five proved fatal from the effects of the operation and seventeen recovered. Kramer's table is not, so far as I know, yet published; but this statement gives a mortality of as nearly as possible seventy-six.

The causes of death in the forty-one fatal cases in Winslow's table were—Collapse in twenty-six instances, inanition in three, peritonitis and gangrene of the colon in nine, while the cause of death was not certain or was not mentioned in the remaining three cases. I have set together the cases of peritonitis and gangrene of the colon, for the latter was the cause of the former in each instance in which it occurred. Gangrene of the colon is actually stated to have occurred in three of the cases, the cause being extensive or very tight adhesions of the disease to the colon or meso-colon, necessitating the removal of a large part of the meso-colon, so that the nutrition of the bowel at this point was fatally interfered with. The recommendation has been made by Czerny that the portion of the bowel corresponding to the excised meso-colon should also be removed, on account of the certainty of this accident if it is left. But the more reasonable suggestion is, to discontinue the attempt at excision of the pylorus in cases in which there are such extensive or firm adhesions as will render necessary the removal of a piece of the meso-colon. For, to give no other reason against such a formidable addition to the original operation, the duration of the operation must be so greatly prolonged by this proceeding that that alone would greatly lessen the prospect of a successful issue. I have said in the earlier paragraphs of this chapter that the operation has sometimes lasted as long as three hours. Winslow says that *five hours* have been consumed in completing it, and that no patient has recovered from an operation which lasted even three hours. Winslow also points out that Billroth and his assistants have had the greatest success in operations for resection of the pylorus, and attributes this circumstance, in part at least, to the greater skill of "the master and his pupils," and to the greater celerity with which they were able to complete their operations. Two of Billroth's own operations were concluded in an hour and a quarter and an hour and a half respectively, in spite of the fact that a very large portion of alimentary canal was removed in one of them. It is therefore evidently desirable that the operation, if it is to be performed in future, should be as speedily performed as is possible and consistent with the perfection of its different parts. The peritonitis which was the cause of death in several instances was in most of them septic, and one if not two of the patients who are said to have died of collapse or of uncertain cause appear to have fallen victims to sepsis. Still, the number of cases of septic poisoning is on the whole small—a circumstance which may partly be accounted for by the very large number of deaths which occurred within a few hours of the operation from collapse. The reasons for the large number of cases of fatal collapse may be found, not only in the great length of time consumed in some of the operations (certainly not longer than has frequently been consumed in successful cases of ovariotomy), but in the very emaciated and debilitated condition of the patients, and in the exhausting character of some of the preliminary preparations for the operation, which appear nevertheless to be absolutely necessary. As might be anticipated, most of the fatal cases were those in which there were many and firm adhesions to the surrounding structures, especially to the colon and pancreas, for not only was there of necessity more hæmorrhage during the operation and greater danger of subsequent bleeding, but there was often serious injury done to the parts during the separation of the adhesions, while the length of time required for the operation was increased. I have already alluded to the effect on the nutrition of the colon which may be produced by these adhesions. Kramer says that almost every one of the cases in which there were extensive adhesions terminated fatally. The converse of this is also true; for according to the same writer, seventeen of the thirty patients in whom there were no adhesions or only very slight adhesions recovered. In glancing through Winslow's tables, one could almost pick out the cases of recovery from the column which contains information of the relation of the disease to the surrounding structures, by selecting the cases in which there were no adhesions.

In speaking of the celerity with which the operation may be accomplished I ought to have referred to the necessity for the greatest care in suturing the stomach and duodenum together, for the smallest defect in the line of sutures must almost certainly be followed by peritonitis if the patient survives the shock of the operation. Yet the number of instances in which death was attributed to this cause was very small. I can only find in Winslow's table three with a note to the effect that the sutures had given way, and one of these cases does not belong to the fifty-five from which our analysis is made, for the disease was a simple stricture. Each one of these three patients died, as might have been expected, of peritonitis. It is of course possible that the stitches gave way in many more instances than these, in some of the cases for example in which the patient is said to have died of collapse, and the fact either was not known or was not noted in the account of the case. Two other circumstances are worthy of notice in their relation to the mortality of the operation, first the age, secondly the sex of those who recovered. The patients who recovered were for the most part under forty years of age, only four of them being older than forty, and only one more than fifty (fifty-two). This is no otherwise than might be expected. But a more curious fact which Winslow has not mentioned is that eleven of the recoveries took place in women, only one certainly in a man, for the sex of the thirteenth is not noted. This may be a mere coincidence; the total number of women operated on was about twice as large as the number of men, which again may be fortuitous, for the number of men who suffer from the disease is probably rather larger than the number of women. But it is on the other hand not improbable that the good fortune which attended the operations on women may be fairly attributed to the greater ease with which they appear to recover from abdominal operations of all kinds. The disproportion of the sexes among the recoveries must be borne in mind in future analyses, for it is important that it should be either confirmed or corrected.

Cures due to the Operation.—Having in view the immense mortality of resection of the pylorus, it ought surely to be expected that the few persons who survive the operation should not only survive it, but should remain free from recurrence *in sitû* at least, or be spared in comfort for two or three years or more. But to my mind the history of the patients who recovered does more to discredit the operation than the excessive mortality. Two of them do not appear to have been followed up after their recovery from the operation, and in one case the patient was alive and well when last heard of, but the interval between the operation and this note is not stated. Winslow says that the first two of these three patients are probably still alive, but there is no other reason for thinking so than that they have not been reported yet as dead. Every one of the ten remaining patients is either dead or is suffering from recurrence. Billroth's celebrated case, which created so much astonishment in 1881, and which was regarded as a triumph of surgery, terminated fatally from recurrence of the disease four months after the operation. Woelfler's patient remained well for a year, when there was recurrence of the cancer (in the cicatrix) which was successfully removed. Later, the groin glands became affected, and at the last report, she was in the hospital (four years after the first operation) dying slowly of cancerous disease. A third patient (Czerny's) died of recurrence eighteen months after the removal of the pylorus. The fourth (Molitor's) died within a year with a rectal and pelvic tumour, probably glandular affection secondary to the pyloric affection, but an autopsy was not made. In the fifth case (Czerny's also) death took place within fifteen months, but I do not know the cause of death. The sixth patient (Billroth's) died a year after the operation with a recurrent mass. In the seventh (Socin's) the disease recurred in the course of a few months and it was necessary to perform gastro-enterostomy for the relief of the obstruction produced by the recurrence. The eighth patient (also Billroth's, which I ought to have placed fourth, for it is No. 18 in Winslow's chronological table and precedes Molitor's case) died in about ten months from recurrence. The ninth and tenth patients were both treated by Billroth; one of them died in twelve months, the other in less than nine months, both of recurrence of the disease. There is not one, therefore, of those who recovered from the operation who can be claimed to have been really cured of the disease. The most satisfactory cases are those in which the history of the patient was not followed up for more than a very short period after the operation: for in them it is at least possible to say that perhaps they are still alive and well. Yet the cases in which recovery from the operation took place were, so far as could be judged, singularly favourable for the operation. In the very large majority of them the disease was very limited in extent, was not complicated by adherence to the surrounding parts, while the glands, so far as could be seen, were not affected by the cancer.

Are patients who are not cured, relieved by the operation? Even this cannot be claimed in many cases. In the preceding paragraph I have stated that gastro-enterostomy was necessitated for the relief of Socin's patient on account of the local recurrence of the disease. Kramer, in the review from which I have quoted, says that the collection of cases he has made contains two instances of this kind, one of which is however probably Socin's. The condition of all the patients who died of recurrence is not known to me, but the fact of the recurrence being *in sitû* in several, if not many of them, leads me to fear that the relief obtained by the operation was not abiding, and that the patients suffered as great distress from the recurrence as they had done from the primary disease.

Conclusions.—The excessive mortality due to the operation, the rapidity of recurrence in what have appeared to be most favourable cases for operation, the return of the symptoms of obstruction in some, if not many, of the cases, and the fact that there does not yet appear to be one case which can be claimed as a genuine cure lead me to doubt whether the operation of resection of the pylorus for cancer is ever a justifiable operation.

Although I have purposely avoided in most of the sections any reference to or account of palliative operations, I cannot refrain here from mentioning the operation of gastro-enterostomy, which has been devised for the relief of persons suffering from the distressing symptoms due to cancer of the pylorus. Hitherto it has been performed chiefly in cases which have not been deemed suitable for the operation of resection. The mortality has therefore been large. But it appears to me to offer a chance of relief in cases in which the disease is not nearly so advanced, cases which have hitherto been regarded as good for resection, and in which the mortality is not likely to be nearly so large. For an account of this operation, the reader may be referred to von Hacker's monograph on the stomach-operations practised in Billroth's wards, which was published in 1886.

CHAPTER XX.

INTESTINE.

It is possible that any part of the intestine, from the pylorus down to the rectum, may be the seat of malignant disease, but there are certain regions which are peculiarly liable to it. In the small intestine the pylorus itself (the treatment of which is separately considered) and the ileo-colic valve, and in the large intestine the descending colon and the sigmoid flexure, are the parts in which cancer develops more frequently than elsewhere.* Although various forms of cancer have been described, I am strongly inclined to agree with Treves (*Intestinal Obstruction*, London, 1884), that nearly all, if not all, primary cancers of the intestine, whether affecting the small or large bowel, are columnar-celled cancers, or as they are often called, columnar- or cylindrical-celled epitheliomas. Secondary cancer, both sarcoma and carcinoma, is not uncommon; and the suggestion of Treves, that many of the reported cases of scirrhous and medullary carcinoma are really secondary not primary tumours, is not improbably correct. However this may be, the large majority of instances of primary cancer of the intestine are certainly instances of columnar-celled cancer, and are the cases which give rise to symptoms of intestinal obstruction and to the necessity of operative interference.

The disease may commence as a nodule, or a plaque, or a ring, which surrounds more or less speedily the circumference of the bowel. Ulceration occurs early, and often advances so rapidly that there is practically no tumour, although the disease is distinctly a tumour-disease. Whether ulceration takes place or not, the cancer probably exists long without producing symptoms of obstruction—I say probably, because it is possible the malignant disease may have existed for months in some, if not in many, cases without producing any symptoms, and the symptom of obstruction may be the first which indicates the existence of intestinal disease. The entire thickness of the wall of the bowel becomes gradually infiltrated, and the cancer may extend into the surrounding structures, causing the gut to adhere to them. The length of bowel affected is in many instances very short, but in other cases of not longer duration, may be considerable. Secondary deposits may occur in the mesenteric and other lymphatic glands; this has been noted in about half the total number of cases in which an autopsy has been made; and more rarely, but by no means infrequently, nodules are discovered in the liver and other of the internal organs. It is said that two separate masses or plaques or rings never occur in primary cancer of the intestine; but although the occurrence is undoubtedly unusual, there is no reason to believe that it is impossible, and there is at least one case on record in which two separate masses existed, one in the transverse colon, the other in the sigmoid flexure. The gradually increasing obstruction to the passage of the contents of the bowel is followed by the natural consequence of obstruction—dilatation of the canal immediately above the seat of stricture, and in the dilated part ulceration may take place. Sometimes such simple ulceration extends far up the interior of the bowel; but, whether it is limited or extensive, it is always the source of danger to life, on account of the liability of the ulcers to deepen and perforate. From the commencement of the symptoms to the time of death, there is seldom a longer period than a few months, on the average not much more than six, and many cases terminate fatally in a far shorter period than this, while only a few last longer than a year or eighteen months.

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* In the thirty-seven cases of resection for malignant disease, to which reference will presently be made, the disease occurred in the various parts of the intestine in these proportions:—Large Intestine, 32; Small Intestine, 3; Uncertain, 2.

The parts of the large intestine which were attacked were Cæcum, 7; Ascending colon, 4; Transverse colon, 3; Descending colon, 7; Sigmoid flexure, 9; "Colon," 2.

The manner in which death occurs is sometimes by acute obstruction, sometimes by chronic obstruction, sometimes by perforation of the bowel and consequent collapse or peritonitis, sometimes by slow exhaustion. Accidents of various kinds may be noted, such as the attachment of the cancerous portion of intestine to another part of the bowel and the formation of an opening between them.

Cancer of the intestine appears to attack males and females in almost equal numbers, and is far more common after than before forty years of age.

I have said nothing of colloid cancer, which was formerly described as a common disease of the intestinal tract; and the reason for this omission is similar to that which has led me to do no more than mention the possible occurrence of scirrhous and medullary carcinoma—namely, the feeling that many, if not all, of the cases of colloid disease are only cases of secondary (not primary) disease. Yet probably they are not cases of secondary disease of the same kind as the cases of scirrhous and medullary cancer, but are rather examples of transformation of the structure of the usual form of carcinoma of the intestine.

Methods of Operation.—Although the operation of removal of a portion of the intestine for cancer was performed on a single occasion thirty years ago by Reybard, only within the last six years has it been practised by different operators with the deliberate attempt to introduce it into surgery. Even in 1882 Marshall was only able to collect half a dozen cases, including one case in which he had himself performed the operation; and in the following year Reichel (*Deut. Zeitsch. f. Chir.*, 1883, p. 230) gathered together from various quarters ten cases of resection for cancer. Since that time the number of cases has increased considerably in proportion, yet even now it is difficult to estimate the value of the operation.

Resection of cancerous intestine has been performed under two very different circumstances: first, as a set operation, when the abdomen or the loin has been opened with the deliberate intention of removing cancerous disease; second, as an addition to an ordinary operation for colotomy, when cancer has been detected through the colotomy wound, and the operation has been extended for its removal. When the resection has been performed with deliberate intention, laparotomy has usually been selected on account of the greater certainty which it affords of reaching the stricture, and the greater ease of resecting it, and afterwards bringing together the ends of the divided bowel. It does not, however, follow that the abdominal incision will certainly offer these advantages over the incision in the loin, particularly when the stricture is situated in the descending colon; for Marshall, making an exploratory opening in the linea alba, found it necessary to abandon it, and make a second incision in the loin, in order more easily to reach the disease. Nevertheless, if the intention of the operator is to join the ends of the resected bowel immediately after removal of the disease, there can be no question that the abdominal incision is far better suited to this purpose, for the opening in the loin affords a very limited space for manipulation.

I think it will best serve the purpose of this work if I describe both the abdominal and the lumbar operations, and afterwards mention such modifications as have been found necessary or desirable in peculiar circumstances.

Colectomy through a Lumbar Incision.—Unless the situation of the disease can be accurately diagnosed, it is very unlikely that the ordinary incision for colotomy will be selected for colectomy. When it has been chosen, it has almost always been with the intention of simply opening the bowel for the relief of obstruction, and the removal of the stricture has been undertaken after the bowel has been opened. Mr. Bryant has given an excellent description of this operation in the *Transactions of the Medico-Chirurgical Society for* 1882 (vol. lxv. 131), and I shall avail myself of it. He says: "I started with the intention of performing a left lumbar colotomy, and for that purpose made my usual oblique incision midway between the ribs and crest of the ilium, with its centre corresponding to the outer border of the quadratus lumborum muscle, one inch behind a vertical line drawn from the centre of the crest of the ilium. The bowel was exposed without difficulty, and a hard indurated mass of new growth was then felt at the fore part of the wound, attached to what was supposed to be the descending colon passing downwards from the loin to the pelvis. I opened the bowel and stitched it to the integument with six sutures, under the conviction, from its relative position to the diseased mass, that I was above the disease. No motion or wind, however, passed through the opening, and the finger, after its introduction through the artificial opening into the bowel, returned unsoiled. A closer examination was consequently made, and in separating the edges of the artificial anus, a sudden change in the position of the parts took place, and there appeared through the artificial anus a growth which looked more like the neck of a uterus with a dilated os than anything else. Into this I passed a catheter, when wind and fæces at once escaped, proving to demonstration that the opening into the bowel which I had made was below the disease, although I had opened what, from its position, appeared to have been the upper part of the bowel. The artificial anus I had made was then at once unstitched, and the true position of the parts carefully examined; and finding on manipulation that the strictured bowel was free and movable, that the stricture was an annular one, and that it did not involve more than one inch of the bowel, I determined to resect it, and to fasten the divided ends of the bowel to the lumbar wound, and this I subsequently executed without much difficulty.

"I commenced the operation by drawing the diseased part of the bowel well out of the wound, and giving it in charge of Dr. Collins to hold. I then opened the distended upper bowel transversely about one inch and a half above the seat of the stricture, stitched the anterior border of its walls to the upper lip of the skin wound with three sutures, and allowed the bowel gradually to empty itself of quarts of slate-coloured liquid fæces. I took care also, during this fæcal drain, to keep the anterior and lower surfaces of the wound clean. When the fæcal discharge had ceased, or nearly so, and the parts had been cleansed, the section of the remaining two-thirds of the calibre of the bowel was made, and I did this leisurely and carefully with a pair of scissors, by half-inch cuts through the bowel, twisting bleeding vessels as they were divided, and stitching each portion of the bowel as cut to the lips of the lumbar skin wound, carefully sponging the wound as I progressed. Indeed, it was by this same gradual process of dividing, sponging, and stitching, that I separated the strictured segment of the bowel from all its attachments, and so shut out the peritoneal cavity, and completed the operation, and I may add that, beyond the necessity of care, I found but little difficulty in its performance. The upper orifice of the lower end of the bowel I secured at the lower lip of the wound in front of the artificial anus, and in close contact with it. I did this with the view of facilitating the restoration of the continuity of the intestinal tract, and closure of the artificial anus at some future time, should the patient feel disposed to submit to the operation, and the measure appear desirable, which I am disposed to question."

It will be observed that Mr. Bryant did not make any attempt to bring together the divided ends of the bowel, but left an artificial anus, placing the ends of the bowel, however, so near together that a future operation for uniting them might be easily performed if it were deemed desirable. His patient was alive and well a year after the resection of the cancerous gut, but no further operation had been practised, or appeared likely to be practised. From the description of the resection I imagine there would not have been any serious difficulty in uniting them after the removal of the diseased portion of bowel, but the wiser course was no doubt to establish an artificial anus, for the patient was very ill, the operation had already lasted sufficiently long, and the operator was not prepared for the particular operation which he performed.

Colectomy or Enterectomy through an Abdominal Incision.—As I have taken Mr. Bryant's account of the manner in which an actual operation through the loin was performed, so I shall take a description of an actual operation performed through the abdominal incision, and for this purpose shall avail myself of the account given by Mr. Treves in the sixty-sixth volume of the *Transactions of the Medico-Chirurgical Society* (1883, p. 65). It is as follows:—"At 10 P.M. the man was anæsthetized, and the abdomen once more very carefully examined, with the same negative results (no tumour felt). I then made an incision in the middle line below the umbilicus. The first part of the intestine to present was a greatly distended cæcum. Introducing the hand into the abdomen, I proceeded to examine the whole length of the colon, and soon found a small hard mass in the descending colon about two inches or so below the splenic flexure. To fully expose it, the small intestines were allowed to protrude. They were deeply congested, and presented a vast number of blood extravasations under their peritoneal covering. They were carefully protected by warm carbolized cloths, but I feel sure that to allow the escape of these parts was a mistake in the procedure that may and should have been avoided.

"With a blunt director I divided the peritoneum that was reflected from the descending colon to the parietes, and with some little manipulation dragged the strictured bowel towards the middle line. I soon had freed it sufficiently to allow of one clamp being applied above the seat of the disease, the other clamp having been already applied to the gut below. I divided the peritoneal connection of the part to be removed, resected it, and applied the sutures to the divided ends of the bowel in the manner already described. The frame answered admirably, and without its use I believe that the resection would have been impossible owing to the depth at which one had to work. The clamps, frame, and distending bag were all employed in this case. I introduced twenty-five sutures after Lembert's method, bringing the two serous surfaces together, and avoiding the mucous membrane with the needle. The clamps were then removed, and the fæcal matter in the distended gut above the resection line was squeezed down so as to occupy the part just operated upon. I was glad to find that even when pressure was applied to the part above, no escape from the gut of its contents occurred at the line of the sutures. The bowel was replaced, and the abdominal wound closed. The operation took one hour and a quarter, and was performed under strict antiseptic precautions."

Mr. Treves's patient died very shortly after the operation, and the abdomen was found to be the seat of commencing general peritonitis; but it is worthy of note that, although the bowel was distended with fæces above, below, and at the seat of resection, none of the contents had escaped into the abdominal cavity.

Treves employed the median incision, and this has been selected in the majority of instances in which laparotomy has been performed, whether a tumour has been distinguished in the abdomen or not. But Whitehead has performed the operation through the linea semilunaris (*British Medical Journal*, 1885, i. 173). In his case, a tumour in the near neighbourhood of the cæcum could be easily felt before the operation. The resected portion of the bowel included the ileo-colic valve, the cæcum, and the greater part of the ascending colon. His operation differs in another important respect from that of Treves, for no attempt was made to unite the divided ends of the bowel, but the ileum was attached to the integument, and an artificial anus was established. Death, however, took place in the course of a few days from peritonitis.

The two great methods of removing cancerous bowel have been described in the preceding paragraphs, but there are several points to which it is necessary to direct attention. It so happens that the portion of intestine resected in these two instances was a portion of the large intestine, and this will usually be the case, or has been usually—nay, almost invariably—the case; but the manner of performing the operation has not differed materially in those instances in which the disease has been seated in the small intestine. Naturally, the operation of laparotomy has been selected, for there would be greater difficulty in removing the disease through the lumbar incision, although this might not be impossible; and in such cases the union of the divided ends is more necessary than in the case of disease of the large intestine, for the higher the disease in the bowel, the less perfect is the nutrition of the patient after the establishment of an artificial anus.

The question is still undecided whether, after resection of a portion of the large intestine, it is advisable to establish an artificial anus, or to bring together the divided ends of the bowel. And, again, there is a difference of opinion with regard to the desirability of bringing together the divided ends at the time at which the resection is performed, or to do so at a later period by a second operation. When it is possible to establish an artificial anus in a convenient position, this course would be preferred by the majority of operators on account of the advantage which it offers of concluding the operation in less time than when enterorrhaphy is performed. The divided ends of the bowel may be placed in such a position that there shall be no difficulty in finding them if enterorrhaphy is performed at a later date.

In the actual performance of enterorrhaphy two objects must be attended to above all others: first, the prevention of the escape of the contents of the bowel into the cavity of the abdomen; second, the union of the serous surfaces of the intestines in so perfect a manner that the escape of the contents shall not take place during the first day or two, and that there shall be union all along the line of attachment as firmly and speedily as possible. During the operation the ends of the bowel may be held by an assistant, or may be fixed by means of one of the clamps which have been invented for the purpose. The clamp is much to be preferred to the fingers on account of the greater space which it affords the operator, who is often obliged to work through a comparatively small opening deep down in the abdomen, and because the fingers are prone to slip, especially as the sewing together of the intestine must needs occupy a considerable time. I will not here describe the clamps which may be used for this purpose, but will mention as exceedingly well suited those invented by Treves and Bishop, and will refer the reader to Treves on *Intestinal Obstruction*, not only for a description of both instruments, but for sketches of them. Nor shall I describe the method of sewing the ends of the bowel together further than to say that the utmost care should be taken to bring the serous coat of each end in apposition. The best suture for this purpose is the Lembert or Czerny-Lembert suture, which consists of a double row of sutures, the inner at the edge of the inverted serous and muscular coats, the outer through the serous coat and as little as possible of either of the inner coats. As many as thirty or forty sutures ought to be introduced, and peculiar care must be devoted to that part of the intestine which lies at the attachment of the mesentery, for that is the part most difficult to unite perfectly, and the part at which there is most frequently failure of union. The large majority of the sutures are in the external row, the proportion being almost or quite two to every one in the internal row. The material recommended by Treves is the finest Chinese twist. During the passage of the sutures the clamp is of the greatest service. It might of course be replaced by clamp-forceps, but it is not safe to employ them unless their blades are guarded with india-rubber or some equally soft material, on account of the liability of the intestine to gangrene if great and hard pressure is employed upon it. Guarded forceps are much more likely to slip than the clamps which are constructed for the purpose. Those surgeons who are curious in such matters may be referred to the excellent paper by Mr. Bishop on "Enterorrhaphy" in the first volume of the *Manchester Medical Chronicle*, where a large number of different methods of applying sutures are described.

Treves considers it essential that, when the diseased portion of the bowel is removed, a triangular segment of the mesentery corresponding to it should be also cut out if the divided ends of the bowel are to be sewn together. If this precaution is not taken, kinking of the bowel at the seat of the suture will almost certainly occur at a later period.

Last of all, but by no means least of all, the operation should be performed with the strictest antiseptic precautions, but without the use of the spray, on account of the cold which the spray produces; and every care must be taken to keep the patient warm during the long trying operation by means of hot cloths and hot water. After the operation the patient usually needs nourishing diet in the liquid form, and when an artificial anus has been established there is no reason to employ any other after-treatment than is employed in the case of simple colotomy.

Results of Operations.—The most complete table of cases of resection for malignant disease is that published by Robert F. Weir in the *New York Medical Journal*, Feb. 13, 1886, p. 196. It contains all the cases he has been able to collect either from literature or from reliable oral communications, thirty-five in all; but in two of these cases (4 and 12) the disease was so extensive and so situated that it could not be removed. The operation was not completed in either of the two, and they should therefore be omitted from consideration, except in so far as they must be admitted rather as evidence against the operation, one of them having died of the effects of the exploratory proceeding. To the thirty-three remaining cases I can add four, which have been gathered from the most recent literature, which will make the total number of available cases thirty-seven. The sources from which Weir's cases are drawn are mentioned in the last column of his table; the four cases which I am about to add to his table are published in the *British Medical Journal*, 1885, i. 171 (Whitehead); *Centralblatt für Chirurgie*, xiii. 173, 1886 (Kosinski); *Wiener Med. Presse*, xxvii. 148 and 238, 1886 (Hofmokl and Obalinski).

Mortality of the Operation.—Of the thirty-seven patients on whom the operation was completed, eighteen died shortly afterwards, either owing to the severity of the operation itself, or because they were so weakened by the disease that they were not in a fit condition to bear it. In at least five of these cases, the immediate cause of the operation was *acute* obstruction, and every one of them ended fatally. Dr. Weir remarks: "The presence of acute obstruction is considered by Schede to contra-indicate the operation. The exact number of cases in which peritonitis was the cause of death, and the condition of the intestine at the time of death, cannot be accurately estimated. Six of the eighteen fatal cases were, however, known to have been due to peritonitis, and one to suppuration around the sutured gut, the tissues being infiltrated with dirty pus. Two patients died of collapse; three of exhaustion and inanition. One patient died on the ninth day after the resection. It is stated that the sutures had given way, but there was no peritonitis. In another case, there was stercoraceous vomiting on the sixth day; the wound was opened, and as no cause was found, an artificial anus was made. The patient died, and no autopsy was performed. Of the four remaining cases, the report merely states that the patients died, but does not mention the cause of death.

I have examined the list of fatal cases to see whether the kind of operation which was practised could be thought to have exercised a considerable influence on the death-rate. Laparotomy was performed in the very large majority of them, certainly in twenty-eight out of the thirty-seven cases. The incision is not mentioned in six or seven cases. Only in three instances is the disease distinctly stated to have been removed through the lumbar incision, and in one of the three the lumbar wound was made after and to supplement the abdominal incision. This patient (Marshall's), and one of the two others on whom colotomy was practised, died; but the death of the second patient (Lammiman's) could not be attributed to the operation, which was not performed until the patient was at the point of death. Of the twenty-seven cases in which the diseased intestine was removed through the abdominal incision without any supplementary incision, thirteen died, thirteen recovered, and the result was not known in one case. The numbers so nearly resemble those of the total result that it cannot be said that the fatal result largely depends on whether the incision is lumbar or abdominal. Then follows the question of the effect of enterorrhaphy on the mortality. The intestine was joined and sutured in twenty-four cases. Twelve of these cases were fatal and twelve ended in recovery; again a result corresponding with the total result. Further, it is to be noted that, although the stitches gave way on more than one occasion, this accident was not by any means necessarily fatal. Fæcal matter discharged through the wound certainly in two instances; a fistula was established, in the course of time healed, and the patients recovered. The deaths which were known to be due to peritonitis were equally divided between cases in which enterorrhaphy was performed and those in which the intestine was not joined. On the other hand, it must be noted that the two cases in which the patients died of collapse, and two out of the three cases in which exhaustion proved fatal shortly after the operation, were cases in which the intestine had been sutured. Although, therefore, it cannot be distinctly maintained that the method of performing the operation largely influences the result in so far as the mortality is concerned, it is perhaps fair to draw the conclusion that a better result might have been obtained if the operators had been content with resecting the intestine and establishing an artificial anus, which might of course have been dealt with at a later period. This certainly is a direction in which experiment may hope to achieve better results in future.

In looking at the large mortality which has resulted in cases of resection of the intestine, it must always be borne in mind that the conditions under which the operation has been performed have often been conditions which have rendered surgical interference imperative. In some of the cases there has been acute obstruction, in others chronic obstruction; and the question has lain between resection of the diseased intestine and colotomy, or laparotomy with the establishment of an artificial anus. Some, if not many, of the patients who died within a few days after the operation would have died as soon if no operation had been performed. Operations which are practised merely for the relief of obstruction depending on malignant disease are scarcely less fatal than operations in which resection of the intestine has been performed. The conditions must not, therefore, be compared with those in which the breast or larynx is removed for malignant disease.

Cures effected by Resection.—The results of resection in relation to the cure of cancer of the intestine are not by any means assuring, so far as our experience goes at present. Only in one instance, so far as I am aware, has the cure lasted for more than one year after the resection was performed. Gussenbauer and Martini removed four inches of the sigmoid flexure, turned the lower end in upon itself, sutured and returned it to the pelvis, and made an artificial anus of the upper end at the upper part of the wound. The incision was made over a tumour which could be felt in the left side of the abdomen. The operation was performed in November 1879; in two months the patient resumed work; and in 1883 was reported by Schede to be well and free from recurrence. The history of thirteen of the eighteen cases in which recovery followed the operation is recorded; in the remaining five, either the patient had been lost sight of, or the operation had been only quite lately performed. In six cases, including that which has just been mentioned, freedom from recurrence is recorded at intervals respectively of two and a half months, seven months, nine months, ten months, and eleven months after the operation. One of the patients suffered, nine months after the resection, from intestinal obstruction. Schede, under whose care he was, opened the abdomen, discovered a band, which he divided. The patient died, and no recurrence of the disease was found. In three of these "cured" cases enterorrhaphy was performed; in two an artificial anus was made. Very little information regarding the effect of suturing the intestine on the future of the patient, supposing recovery from the operation takes place, is consequently afforded by these cases: this information may, however, be obtained from cases of laparotomy and enterorrhaphy which have been performed for other diseases than cancer.

In seven instances, more than half therefore of the cases in which the further history of the patients was followed, recurrence took place. In two of them death occurred from this cause within a year and a half after the operation; but in the remaining cases the disease recurred very rapidly—so much so, that one of the patients was known to be suffering from recurrence at the end of a month after the resection of the intestine, which was sutured with Czerny-Lembert sutures. In connection with the question of recurrence it must be mentioned that Dr. Weir states in his table that recurrence occurred eleven months after the operation in the case of which Mr. Bryant gives an account in the paper from which I have quoted. I cannot find any confirmation of this statement in Mr. Bryant's paper: "contraction" took place at the opening one year later, but not "recurrence," and the opening was stretched on account of the contraction.

Are patients who are not cured, relieved by the operation? On this point, again, there is at present very little available information. I suppose there can be very little doubt that recurrent disease in most if not in all cases in which the intestine has been sutured, will, as it advances, produce the same symptoms as the original disease, and may produce partial or complete obstruction. It is therefore more than probable that the patient will have to undergo the same distress, or a second time to endure the same symptoms which led to the first operation. The case may, however, be very different when an artificial anus has been formed. The recurrence of the disease need not necessarily take place in the upper portion of the divided bowel. If it does so, it may be possible to remove it; if it cannot be removed, it may be possible to stretch the opening or to keep it dilated without much pain or danger to the patient's life. In any case the exact situation and nature of the disease can readily be discovered through the opening. I regard these questions as some of the most important to which the attention of operators can be directed; and it is much to be desired that those surgeons who resect the intestine for malignant disease should follow up their cases with great care in order to obtain information with regard to the relative advantages of the suture and the artificial anus. At present I confess my inclination is strongly to prefer the artificial anus. Time and greater experience will prove whether this view is correct or not.

Conclusions.—Up to the present time the operation of resection of the intestine for malignant disease cannot boast a large measure of success.

The operation, however, appears to be perfectly justifiable, particularly when it is performed, as is not infrequently the case, for the relief of symptoms for which another serious operation might be required.

In the majority of cases the abdominal appears to be preferable to the lumbar incision, on account of the greater certainty of being able to remove the affected portion of bowel through the opening.

The formation of an artificial anus appears preferable to the union of the ends of the resected intestine: first, because the operation is shorter and less severe; second, on account of the greater facility with which recurrence of the disease can be distinguished and perhaps dealt with.

In cases in which no recurrence has taken place at the end of a year or more, the artificial anus may be obliterated, and the divided ends of the intestine united.

Cases in which there are symptoms of acute obstruction are probably not suited for resection, but the small number of instances from which this deduction has been drawn is not sufficient to permit of the establishment of an absolute rule.

CHAPTER XXI.

RECTUM.

THE rectum is not infrequently the seat of malignant disease, which in the large majority of instances is carcinomatous, and of the variety commonly termed cylindrical- or columnar-celled carcinoma, or columnar epithelioma. The name "adenoid" has been applied to the disease by Cripps, who has made a special study of it. The cases of colloid cancer which have been recorded are probably cases of columnar-celled carcinoma which have undergone colloid transformation. The cases of carcinoma formed of glandular cells and of flattened epithelial cells are usually instances of disease which has extended to the rectum from the margin of the anus or the neighbouring parts.

The disease commonly commences in the lower portion of the bowel, often within two or three inches of the anus. It may form a raised plaque, which appears to be seated in the submucous tissue, and is more prominent in the centre than elsewhere; or it may form a more prominent and distinct tumour, and project into the cavity of the bowel. Sometimes there are several masses or tubers separated from each other by a narrow interval in the place of a single mass. Whether the primary disease is a plaque or a prominent mass, it seldom remains long without ulcerating. It spreads, too, in the submucous tissue, rather in a horizontal than in a vertical direction (although the extension is by no means limited to the horizontal direction), and thus tends to surround the bowel, either wholly or in great part, and so to produce a stricture. Extending through the submucous tissue, it may invade the vagina and uterus in the female, and the bladder and urethra in both sexes; while the prostate is frequently involved in the male. Or it may extend from the back wall of the bowel to and into the sacrum. Owing to the ulceration which is so constantly observed, the affected structures are not merely matted together, but often communicate through ulcerated openings, through which the contents of one cavity escape into another. Bleeding, sometimes very severe, results in some cases from the extension of ulceration into the vessels of the rectum.

At a later period, but varying with circumstances and with the comparative malignancy of the cancer, the lymphatic glands become affected—those of the pelvis and abdomen as a regular rule, but not infrequently those of the groin also, particularly when the primary disease is situated low down in the rectum or at the anus. These enlarged inguinal glands sometimes ulcerate and form fungous protrusions. After death, secondary deposits may be found in the liver, the lungs, and other of the internal organs, or in the bones.

The duration of the disease is seldom more than two years, although instances have been recorded in which the symptoms have existed for as many as five or six years. On the other hand, patients sometimes die within a few weeks or months of the first appearance of symptoms of rectal affection.

Although a few fortunate persons suffer absolutely no distress, or even inconvenience, from the disease, until within a few weeks or days of death, it may easily be conceived, from the account which has been given, that cancer of the rectum is usually a very distressing and horrible disease. A sense of weight or discomfort, perhaps only noticed during or after defecation, is followed by the appearance of blood and matter in the motions, or apart from the motions. Often there is great pain. As the disease advances, symptoms of obstruction are observed, which may terminate in complete constipation, when it may safely be assumed that the end is not far distant, whatever measures are taken for the relief of the obstruction. There is often diarrhœa. The affection of the neighbouring structures may do much to increase the misery of the patient. This is particularly the case when the cancer involves the large nerves, such as those of the sacral plexus. Death may result from various causes—exhaustion, intestinal obstruction, secondary affection of vital organs, ulceration, and fungation of groin glands, &c.

Methods of Operation.—In accordance with the scheme of this work, no account will be given of palliative operations, such as colotomy, or even of those operations which are intended to remove the mass of the disease from the bowel without attempting to take away the seat of attachment or origin. So far as radical treatment is concerned, there is, I believe, only one operation—that of excision of the diseased portion of the bowel. This operation has been performed far more often, and for many years past, in Germany and France, but particularly in Germany. Until it was reconsidered and carefully proved by Cripps a few years ago, it was very seldom practised in England; but during the ten years which have elapsed since the publication of Cripps's *Jacksonian Essay* the rectum has been excised by many surgeons, and on a large number of patients. The material which is at present within our reach relating to the subject is therefore sufficient to enable us to judge with tolerable accuracy of the difficulties and dangers of the operation, and of the advantages which may be expected from it.

Before describing the operation, I may mention that, although it is undoubtedly possible to apply caustics in such a manner as to destroy the diseased portion of the rectum, they have not, so far as I am aware, been employed except for the destruction of very small tumours or epithelial ulcers at the margin of the anus, or for the purpose of removing outgrowths of large internal tumours, which protrude through the anus. For this purpose Allingham recommends the arsenite of copper made into a paste with mucilage, which he says destroys rapidly without increasing the suffering at the time, and without causing bleeding or any serious danger.

Excision of the Rectum is performed as follows :—The patient is placed in lithotomy position; the legs are held by assistants, or by means of Clover's crutch; the buttock is raised on a pillow, so as to bring the parts as thoroughly as possible towards the light. The operator sits or stands. Passing his left forefinger into the bowel, he feels for the tip of the coccyx, then introduces with his right hand a strong and large curved bistoury, and cuts freely through the tissues from the tip of the coccyx out through the integument, so as to lay the cavity of the rectum open as far back as possible. In order to lessen the hæmorrhage, he should cut in the middle line. The left hand of the operator is now placed on the right side of the buttock, so as to draw down the anus and tighten the tissues at its margin, and with an ordinary scalpel, a crescentic incision is made around the anus, from one margin of the posterior incision to the other. The further this incision is made within the bowel, and the less the integument is interfered with, the better for the patient, so far as the integrity of the anus is concerned ; but the main reason of the operation—the removal of the whole of the disease—must ever be kept in mind, and every other consideration must be subordinate to it. The crescentic incision should be so deep that it opens the ischio-rectal fossa ; into it the forefinger is thrust, and the bowel is separated by tearing and breaking down the tissues, until the levator ani is reached, which is divided with scissors. When the bowel has been thoroughly separated behind and at the sides, the anterior connections are attacked, and here the greatest care is necessary to avoid opening the urethra, the vagina, &c. The dissection is made with knife or scissors, or a combination of the two, and great assistance may be obtained by introducing a metal catheter into the urethra in the male, so that the limit to which the dissection can be carried with safety is easily perceived. The difficulties of this part of the operation are far greater when the disease is situated on the anterior wall of the rectum, and the tissues are consequently much more adherent than natural. The assistant may afford great help to the operator by drawing down the bowel as the tissues are separated. When the separation has been carried well up beyond the disease, the bowel is drawn down with a pair of strong vulsellum forceps, and the loop of a wire écraseur, consisting of several strands of wire of moderate thickness, slightly twisted together, is passed up over the vulsellum and the rectum to the point at which it is to be cut through. Instead of the écraseur, a pair of curved scissors may be used. The hæmorrhage during the earlier steps of the operation, which is seldom considerable, is controlled by the pressure of sponges or by Wells's clamp-forceps, and when the bowel has been cut through, the cut margin is carefully searched for bleeding vessels, which are tied. Cripps points out that most of the blood during the separation of the posterior and lateral portions of the bowel proceeds from vessels which are seated in the *walls of the rectum*, so that the grasping of the bowel, which is almost necessary for the performance of the operation, suffices to arrest the hæmorrhage.

The operation I have described is that recommended by Cripps, and is for the removal of the whole circumference of the bowel. It may, and indeed must, be modified for special cases, when only a small portion of the bowel is affected, or when it is very desirable to lessen to the utmost the loss of blood. A hot wire loop may then be employed in the place of the cold wire écraseur.

The mucous membrane may be drawn down and stitched to the margin of the wound at the anus, but this is not desirable; nay, there are strong reasons why it should not be done. First, the stitches usually give way in the course of a few days, the mucous membrane retracts, and no advantage is gained; second, so long as the stitches hold there is danger of matter and fæces collecting behind the mucous membrane and burrowing up around the bowel, from which the most serious consequence may ensue.

The dressing and after-treatment consist in placing firmly, by means of a T-bandage, a large sponge covered with a piece of oiled lint against the wound, and keeping it there for twenty-four or thirty-six hours. The patient lies on his side. After the sponge has been removed, the wound is syringed with Condy's fluid or carbolic lotion; a drainage tube is sometimes inserted at the back part; the position of the patient is changed to the supine, for better escape of the discharges. Every day, or twice a day if there is much discharge, the wound is syringed and dressed with carbolic or sanitas oil. At the end of five days the bowels are usually opened; the patient is often well enough to leave his bed at the end of three or four weeks.

Results of Operations.—*Mortality from the Operation.*—I have collected 100 cases from the following sources:—Fischer, *Ueber die Ursachen der Krebskrankheit und ihre Heilbarkeit durch das Messer* (Rose's Klinik); *Deutsche Ztsft. für Chirurgie*, xiv. 169, 1881; Voigt's Inaug. Dissert., Halle, 1885 (Geuzmer's Klinik), reported in the *Year Book of Treatment* for 1885; Allingham, on *Diseases of the Rectum*, 3rd edition, 1879; Cripps, on *Diseases of the Rectum and Anus*, 1884; Billroth's *Clinical Surgery* (New Sydenham Society), 1881. They are divided in the following proportions: Fischer, sixteen cases; Voigt, eighteen cases; Allingham, ten cases; Cripps, eleven cases; Billroth, forty-five cases. The mortality on the total number of cases was thirty-five, and the deaths are again divided in the following manner: Fischer, eight cases; Voigt, six cases; Allingham, two cases; Billroth, nineteen cases. The causes of death were: Retro-peritoneal suppuration, thirteen cases; peritonitis, ten; exhaustion, five; septicæmia and pyæmia, three; shock, two; embolism, one; urinary infiltration (in a case in which a portion of the urethra was removed during the operation), one case. I regard this mortality of one-third of the cases submitted to operation as far too high, and believe it may, with little difficulty, be reduced by one-half, or even more. In proof of this, Professor Billroth's experience may be studied with advantage. During the period of his surgeoncy at Zurich, between the years 1860 and 1867, he performed the operation of excision in twelve cases, and six of the patients died. The deaths were due in every instance to peritonitis. During the period of his surgeoncy at Vienna, between the years 1867 and 1876, he removed the lower end of the rectum in thirty-three cases. Twenty of the patients survived the operation, thirteen died. The mortality in the second series of cases is therefore, as might have been expected from the improvement which has taken place in the treatment of operation-wounds, much smaller than in the first series. But this is not all. The cause of death in the second series of cases leads one to suspect that far better results might have been attained by a still better method of managing the wound. The translation states that death invariably took place from retro-peritoneal suppuration, which as a rule was characterized by acutely septic symptoms, so that the patients generally died in from four to eight days; two cases only lasted rather longer (p. 256.) In some of the cases, undoubtedly, both from what Billroth himself says, and from the statement in von Winiwarter's *Beiträge zur Statistik*, the upper end of the resected bowel was drawn down and fastened to the margin of the skin wound. At a later period this practice was omitted, but certainly it was followed in many of the cases which were treated at Vienna. Von Winiwarter does not think that it was the cause of the retro-peritoneal suppuration, which he attributes to the character of the loose fat around the lower end of the bowel, and to the difficulty—nay, impossibility—of maintaining a sufficient drainage. Most persons will, however, be far more inclined to attribute the great mortality from retro-peritoneal suppuration to the attempt to unite the edges of the resected part, especially when they see how few patients, with the exception of those operated on by Billroth, died of this accident. Far better results have been obtained by Allingham and Cripps, who show twenty-one cases with only two deaths. Neither of these surgeons is in the habit of uniting the end of the resected rectum to the margin of the anus, and both are in the habit of taking great precautions against the collection of offensive pus in the cavity of the wound by means of drainage-tubes, and frequent removal of the discharge with a syringe, together with the use of iodoform and other disinfectants. The two deaths occurred in patients in whom the peritoneum was opened; in one of them the opening was very extensive—the bowel protruded, and the patient died of shock. It must not be imagined that these were the only cases in which the peritoneum was wounded, and that a wound of the peritoneum during the course of the operation is necessarily fatal.

Complete cure by Operation.—On this point, although some very encouraging cases can be adduced, the general information leaves much to be desired.

Billroth does not mention any of his own patients who had remained free from the disease long after the operation, but says, in speaking of the results of the second series of cases (thirty-three in number), that most of those who recovered from the operation died within two years of recurrence. There is, however, in the statistics of von Winiwarter, which appear to overlap to a certain extent those of Billroth, the record of one patient who was quite well three years after the operation; and Billroth himself, in the notes which accompany the numbers in his *Clinical Surgery*, mentions the case of a lady who had been twice operated on by Low and Schuh for cancer of the rectum, and was quite well between three and four years after the second operation.

Cripps gives an account not only of the eleven patients on whom he had himself operated, but of twelve other patients at whose operations he had assisted, and I have reason to believe that one or more of Allingham's cases is included in this series of twenty-three. He says (p. 399): "Of the nineteen cases that survived, in nine the disease returned between four months and two years after the operation; of the remaining ten, I know six to have been well at periods of two to four years after the operation. One of these cases is very instructive, showing the value of a second operation on the disease recurring."

One of Allingham's patients was quite well after three years, another at the end of more than two years, and a third after one year.

Voigt tells of the good condition of one patient at the end of three years, of a second at the end of two years, and of a third after one year and a quarter.

Fischer claims two complete cures—one of six years' duration, the other of three years and ten months.

Without taking into account Schuh's case, mentioned by Billroth, there are thus thirteen cases in which the patients were alive and well for at least two years after the operation, and this number affords only a partial measure of the complete success, for the history of all the sixty-five patients who recovered from the actual operation was not followed up. In some of the successful cases the disease was extensive, and in more than one of them two operations had been performed on account of recurrence.

Does the operation tend to give the patient a more comfortable *life?* In the answer to this question two circumstances must be taken into consideration: the discomfort which results from removal of the lower portion of the bowel must be set off against the comfort which the patient derives from the removal of the diseased part of the bowel.

The reasons for the operation of excision are: first, the hope of completely curing the disease, but it cannot be said that the prospect of complete cure is large; second, the relief from pain, the prevention of obstruction, the arrest of discharge and hæmorrhage, or the hope of preventing the recurrence of these troubles at a later period of the disease. Also, the hope of preventing the disease spreading to the bladder and other adjacent parts. To effect these results, there must be at least a reasonable hope of completely removing the carcinoma of the bowel, so that it may not return *in sitû*. Unfortunately, the cases recorded by most of the surgeons whose statements have been quoted shew that the disease does return in the rectum in many instances, and that the patient is liable at a later period to the same distress which the operation was intended to alleviate. Volkmann is, however, more sanguine than most surgeons of the success of the operation in this particular respect, and claims for it, in the large majority of instances, an almost certain prospect of so completely removing the original disease, that although many of the patients die of disease of the glands and of the internal organs, there is no recurrence in the rectum. And it is to be noted that Volkmann is not in favour of the extensive operations which have been practised by some surgeons, in which portions of the bladder, prostate, uterus, and other structures, are removed, although he does not hesitate to open the peritoneum. Even in those cases in which there is local recurrence of the disease, the recurrence may not take place for several months, and during that period the patient is spared some at least of the pain and anxiety from which he previously suffered.

With regard to the condition of the bowel after excision, it is admitted—indeed, it stands to reason—that there is always some difficulty with the motions in those cases in which the whole circumference of the bowel has been removed. In the first place, there is obstruction owing to the contraction of the scar-tissue; in the second place, there is, in a certain number of instances, incontinence of fæces, owing to the removal or destruction of the sphincter. The first of these evils is less likely to occur, according to Cripps, if a strip of normal mucous membrane is left, and he recommends, wherever it is possible, that such a strip, however narrow, should be left. This is, of course, only possible in those cases in which the disease does not involve the whole circumference of the bowel. In cases in which there has been considerable obstruction owing to this contraction, and it has not been possible to maintain sufficient dilatation by means of bougies, Allingham has freely incised the contracted part, and has thus relieved the patient. Far more serious, because more difficult to deal with, is the incontinence which occurs. Cripps states that, of thirty-six patients, only seven were unable to hold their motions after the operation, while six of them were troubled with incontinence when the motions were fluid. The same incontinence of liquid fæces is recorded by Volkmann, in the case of a man who was, under other circumstances, able to retain his motions. Incontinence is of course a very horrible evil; but I am sure many persons would cheerfully bear it to be relieved of a disease of the rectum which has been very painful, particularly when there is a remote chance of a complete cure of the disease.

Conclusions.—In considering the advisability of excision of the rectum in any individual instance, we have to face the following facts:—That cancer of the rectum, if not removed, will probably prove fatal in the course of a few months; that death will probably be preceded by suffering more or less acute and long-enduring; that the operation does not offer a good prospect of *curing* the disease; that even when it is successful, it may leave behind incontinence of fæces, and, still more probably, obstruction to the passage of fæces; and that where it does not result in a complete cure, although it may rid the patient for a short period of the disease, and indeed may prevent the disease from recurring in the rectum, it may not relieve him in the least, but may even place him, immediately after the operation, in a more distressing condition than he was before the excision was performed.

In spite of this unpleasant picture, I am in favour of operation — provided only the cases are carefully selected. The conditions most favourable are: disease of limited extent, low down in the rectum, yet not involving the anus; situated on the posterior wall, not involving the entire circumference of the bowel, easily passed by the forefinger. Further, slow progress, although the symptoms have been noticed for a considerable period; freedom of the subjacent structures, absence of the signs of secondary affection of the glands or internal organs, and general good health of the patient.

On the other side must be placed those cases in which the disease is extensive, so high up the rectum that the finger cannot certainly be passed beyond it; firmly fixed to the adjacent structures, especially to those in front; and in which the symptoms have only been noticed a short time, and the patient is unhealthy. The amount of distress suffered by the patient must also be taken into the account.

Between these two extremes many intermediate conditions will be found: cases in which there are several nodules of primary disease; cases in which there is evidence of internal disease, but the primary disease is well within reach, and is the cause of great pain and distress, &c. &c. In some of these cases it will be expedient to operate; in others to refuse operation, however much the patient may press for it. In every case there should be a good prospect of complete removal of the primary disease.

The removal of the disease should be as free as possible; but, if it be consistent with free removal, a strip of mucous membrane should be left to unite the mucous membrane above the disease with that below it, or with the integument at the margin of the anus.

The Removal of Disease situated high up in the Rectum.—In the *Archiv für klinische Chirurgie* for 1886, xxxiii. 563, Dr. P. Kraske of Freiburg i. Br. has described an operation which he has performed both on the dead and on the living subject for the removal of cancer seated so high up in the rectum as to be far beyond the reach of removal in the usual manner. Kraske does not claim to have been the first to practise, or, at any rate, to recommend this new procedure, but attributes it to Kocher of Bern. Since, however, Dr. Kraske has quite lately performed the operation with success, and his directions are very clear, I shall avail myself of his description.

The patient is laid on the right side, and an incision is made in the middle line from about the middle of the sacrum to the anus, down to the bone. The gluteal muscle is separated at its insertion from the lowest portion of the left wing of the sacrum, the coccyx is cleared of the surrounding structures and removed, and the sacro-sciatic ligaments are divided close to their attachment to the sacrum. By this means a great deal of space is gained. Then, with a chisel, the lowest portion of the left wing of the sacrum is removed by an incision in a line from the left border on a level with the third posterior sacral foramen, concave towards the left side, so as to touch the lower margin of the third sacral foramen, and to remove entirely the fourth foramen. No care is taken of the posterior divisions of the sacral nerves; the ventral divisions of the fourth and fifth nerves are divided; that of the third is spared. After the cut surface of the bone has been smoothed, and the soft tissues have been divided down to the bowel, the patient is set up in the lithotomy position, with the pelvis raised as high as is desirable in the usual operation of excision of the rectum. The rectum can now be removed up to the junction with the sigmoid flexure with ease, owing to the space which is afforded by the combination of the posterior incision and removal of the bone with the ordinary incision at the posterior part of the anus.

Kraske gives an account of two patients on whom he operated by this method, and with success so far that neither of them died of the effects of the operation. In the second of the two the carcinoma commenced above the level of the pouch of the peritoneum, so that the peritoneum was opened by the tranverse incision, which was made immediately below the cancerous disease. The peritoneum was opened still more widely at the side, a thick thread was passed through the cancerous intestine, and by means of this it was drawn down. The separation of the bowel from the anterior surface of the sacrum was managed without difficulty with the finger and the scissors (short cuts). The disease extended three or four centimetres up the intestine; above this level the intestine was again divided in the portion which is completely surrounded by peritoneum. After the peritoneal wound had been cleansed and dusted with iodoform, the bowel was drawn down and fastened to the lower part of the rectum, in about two-thirds of its circumference, with catgut sutures. In the cavity of the peritoneum, on the left side, a drainage-tube was inserted; and after the rectum had been closed and distended by means of a large tampon, so as to press together the surfaces of the peritoneum, the whole wound was tamponed with iodoform gauze. There was not any serious bleeding during the operation, and the patient made a good recovery, but there remained a fistulous opening, an open gutter (*rinne*) at the back, which was converted by a later operation into a fistula. The patient appears to have been well and free from disease two or three months after the operation; and in neither of the two cases was there any difficulty in the passage of motions.

I merely insert the description of this operation in order to bring the surgery of rectal cancer as far as possible up to date; but I do not pretend to offer any opinion on the advisability of performing it in the case of cancers seated high up in the bowel. All that can yet be said of it, is that it has been performed.

CHAPTER XXII.

KIDNEY.

THE kidney may be the seat of either carcinoma or sarcoma. The former disease occurs only in adults ; the latter may attack infants, children and adults, but is uncommon in the young and middle period of adult age.

In adults there does not appear to be a wide or essential difference in the course of the two diseases. The duration of the symptoms may be from a few months to several years, but the shorter periods are more common than the longer. The tumour may be confined for a long time within the capsule of the organ, and may even be encapsuled in the interior of the kidney, so that the structure of the tumour is separated from that of the portion of the kidney which is still unaffected by the disease ; or—and this is more usual—it may infiltrate the whole or a large part of the kidney structure. In the course of time it may grow through the capsule into the surrounding parts. The lymphatic glands behind the peritoneum in front of the spine are liable to be affected both by sarcoma and carcinoma, and secondary growths may be found in the lungs, the liver, and other organs and tissues ; in addition to which there may be disease of the other kidney. The frequency with which renal calculus has been found in cases of renal cancer has led to the belief that the cancer is induced by the presence of the calculus.

In children carcinoma has seldom or never been observed, but sarcoma is not a very uncommon disease. It appears in three different forms or under three different conditions : first, as a congenital disease, when a tumour is discovered, often of large size, sometimes exceedingly large, composed of striped muscular fibre mixed with fibrous and sarcomatous tissues. Such tumours are usually perfectly encapsuled, separable without much difficulty from the surrounding tissues, and not associated with affection of the lymphatic glands or with secondary growths in any other part of the body. Moreover, the disease is limited to one kidney. The children usually die at an early age, seldom living to the age of two years.

Second, in the form of a sarcomatous disease of a single kidney, forming a tumour of so considerable a size that it can be felt through the abdominal walls, and may be diagnosed as a renal sarcoma. The disease attacks young children; it affects the lymphatic glands and other organs secondarily.

Third, both kidneys may be the seat simultaneously, and to an almost equal degree, of round-celled or lympho-sarcoma, which may and often does kill the patient without producing tumours of such a size that they can be felt in the abdomen during life. After death the kidneys are not very greatly enlarged, but the glands in front of the spine are affected so that the disease has already advanced towards generalization.

It appears probable that in some, if not in many, of these cases of the third class, the disease does not originate in the interior of the kidney, but in the neighbouring glandular tissues, whence it makes its way into the hilum of the kidney. The general disposition of the disease and its lymphatic or lymphadenomatous structure lend support to this view.

It may be mentioned that the disease, whether sarcoma or carcinoma, varies much in its exact origin and relation to the kidney, for it may arise in any part of the organ, or may be situated between the kidney and its capsule.

Methods of Operation.—The only method of operating on a cancerous kidney is to remove it by the knife; but the manner of removing it varies according to whether the incision is made from the front or from the back.

The **abdominal** incision may be made in the linea alba below the umbilicus, or at the outer border of the rectus muscle, according to the inclination of the operator and the relative probability which each incision affords of removing the tumour easily. The length of the incision depends of course on the size and position of the tumour, and on its relation to surrounding parts. When the abdomen has been opened, the tumour is usually at once seen. The small intestines, if they cover it, must be drawn aside, but the colon is usually fixed more or less closely at its outer border. The peritoneum in front of the tumour is now incised and separated from the mass, with such care that the tumour, which is often exceedingly soft, is not broken. The finger is passed round the tumour in order to free it from the surrounding structures. The pedicle formed by the vessels and the ureter is found, transfixed with a blunt aneurism needle armed with a stout double ligature of carbolized gut or silk, and tied in the same fashion as the pedicle of an ovarian tumour, each half being first included in one ligature, and the whole subsequently surrounded by the ligature which was last tied. The pedicle is then divided, the ligatures are cut short, and the tumour is removed. The abdominal wound is closed in the same manner as an ordinary ovariotomy wound. The operation is performed with the strictest antiseptic precautions, Listerian or other.

The **lumbar** operation is performed by making a transverse or oblique incision rather nearer the last rib than in lumbar colotomy. Morris recommends that with this should be conjoined a second incision, running vertically downwards from the first, and starting from it about one inch in front of its posterior extremity. The vertical incision may be left until the kidney has been reached and explored. Through these incisions the kidney is separated from the surrounding structures, chiefly with the finger or fingers, and care should be taken not to wound the capsule. When the pedicle has been discovered and separated, it should be transfixed, as in the abdominal operation, with a blunt aneurism needle, and tied in two parts. Then follows one of the most difficult parts of the operation when the kidney is very large—its removal through the opening in the loin. In order to effect this it may be necessary to enlarge the opening, or to break up the kidney, which is very undesirable in most instances on account of its very soft consistence and the difficulty of removing the fragments. The peritoneum is not usually wounded. After all bleeding has been arrested, the wound is partly closed, and a tube is inserted so as to ensure free drainage of the whole extent of the cavity. The greatest care and cleanliness are observed during the performance of the operation, but the Listerian antiseptic dressings are not so generally employed as when the abdominal operation is performed.

Of these two methods, the lumbar is that which would naturally be preferred for the reasons given by Morris: (1) the peritoneum is not opened; and (2) the wound permits of excellent drainage. Nevertheless, it is not by any means universally adopted. Many surgeons have preferred the abdominal incision, on account of the greater ease with which the tumour, especially when it is very large, is separated from the surrounding structures, and removed from the abdomen. And surgeons who are in the habit of performing ovariotomy and other similar operations have come so far to disregard opening the peritoneal cavity that it scarcely enters into their consideration in taking into account the relative advantages of the methods. The abdominal operation has, however, been much more fatal than lumbar nephrectomy. The latter should therefore be performed, unless there are special indications for preferring the abdominal incision; and of these indications, probably the chief is the very large size of the tumour, and the improbability of being able to remove it through the loin incision.

Although the operations, as they are described above, do not sound very formidable, and it may appear particularly easy to remove a diseased kidney of large size through an opening in the abdomen, provided the opening is sufficiently large, and directly over the tumour, experience proves that either operation may be extremely difficult; that the attempt to remove the kidney may be unsuccessful, and may have to be abandoned; and that terrible accidents may occur during their performance. In most instances the soft consistence of the tumour, together with its adherence to the surrounding structures, is the cause of the gravest dangers. So long as the capsule is not broken, and the tumour can be separated entire in its capsule, even though this may occupy a very considerable time, all may go well; but if the capsule is torn, the soft material of which the mass is often composed escapes, the operator is in danger of mistaking the interior of the tumour for the surrounding parts, the hæmorrhage is profuse, and the operation will probably never be concluded successfully. As an example of the most terrible of accidents, the aorta was severely wounded in one instance recorded by Czerny, was tied, and shortly afterwards the patient died.

Results of Operations.—*Deaths due to Operation.*—The largest and most recent statistics of nephrectomy with which I am acquainted are those collected by Gross (*American Journal of the Medical Sciences*, July 1885). They include the earlier tables of Barker (*Med.-Chir. Trans.* lxiii.) and Czerny (*Trans. Internat. Med. Congress*, 1881); and also apparently his own earlier report in the *Philadelphia Medical Times*, May 1885.*

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* The numbers quoted from Gross at page fourteen of the Introduction were taken from the paper in the *Philadelphia Medical Times* before I had seen the paper in the *American Journal of the Medical Sciences*. The total number of cases of nephrectomy for malignant disease is smaller in the former paper and the proportion of deaths is larger. In the Introduction it appears that there were twenty-eight deaths of forty patients on whom the operation was performed. The amended numbers are twenty-nine deaths in forty-seven cases.

Dr. Gross finds that there are records of forty-seven nephrectomies for sarcoma and carcinoma, performed on patients of both sexes and of various ages. Twenty-nine of the patients died of causes more or less directly connected with the operation, and eighteen recovered. Thirty-three of the operations were performed for sarcoma with nineteen deaths and fourteen recoveries; fourteen were performed for carcinoma, with ten deaths and four recoveries. The mortality of the operations for carcinoma was therefore much larger than of those for sarcoma. The number of cases of the two diseases is of course not equal, and it might happen that an equal number would give different results. But this is not probable; for it appears that carcinoma of the kidney is on the whole more malignant than sarcoma, is more prone to form early and extensive adhesions, and is consequently more difficult to remove without serious damage to the surrounding important structures.

Gross's paper does not tell the relative results of operations performed on males and females; but the results for age are as follow:—Among the patients with carcinoma there were no children; but among the patients with sarcoma, there were sixteen between the ages of sixteen months and seven years, of whom nine died and seven recovered from the operation. The number of cases, therefore, in young children and adults is almost the same, and the results, so far as recovery from the operation are concerned, are also as nearly as possible the same. Had the ages of the children varied from seven to fourteen years, instead of from seventeen months to seven years, the proportion of recoveries would probably have been much larger.

I have already said that the abdominal is more dangerous to life than the lumbar operation, and Gross makes the numbers thus: thirty-five abdominal operations, with twenty-three deaths and twelve recoveries; eleven lumbar operations, with five deaths and six recoveries; one uncertain, of which the result was death. I take it that the reason of this difference is not merely the opening of the peritoneal cavity and disturbance of the contents of the abdomen in the operations performed from the front, for there are very few instances of peritonitis among the fatal cases; but the fact that the abdominal operation was rendered necessary by the larger size of the tumour in these cases, and by the absolute impossibility of removing it through the incision in the loin. It is much more a question of difference of size and importance of tumour than of method of operation.

The causes of death are given in twenty-eight of the twenty-nine fatal cases; they are of great interest, for they show how very formidable the operation is when practised for malignant disease, regarded as a mere surgical procedure. Nine patients died of shock, three of hæmorrhage, and three of exhaustion; fifteen of the twenty-eight therefore of causes which are particularly the results of large and formidable operations. Of the remaining thirteen, one died of "metastasis," by which it may be imagined that it is intended to convey that the death was rather due to the disease than to the operation, and I do not quite know why this death has been placed among those due to operation, unless it be that the patient died so speedily after the kidney was removed that the operation, not the generalization of the disease, was the direct cause of death. One patient died of pulmonary embolism, and one of tetanus. Three died of uræmia or anuria; a small number when it is remembered that the operation was removal of the kidney. But apparently these are rare causes of death after nephrectomy, unless the other kidney is diseased. Two died of septicæmia, and five of septic peritonitis. The number of instances of septicæmia and septic peritonitis will not appear so small in proportion to the total number of deaths due to the operation, when it is taken into account that fifteen of the twenty-eight patients were, so to speak, killed outright by the operation, before they had time to exhibit symptoms of septic poisoning; or the symptoms of septic poisoning were lost sight of in the more marked symptoms of shock, and hæmorrhage and urinary trouble.

The death-rate on the total number of cases is enormously large, more than 60 per cent.; for carcinoma more than 71 per cent. Nor do I think that a study of the causes of death, whether made from the paper of Gross or from the reports of the individual cases, will lead to the opinion that there is a reasonable prospect of largely diminishing it, unless the diagnosis of the disease can be made at a much earlier period than it has been hitherto.

Cures due to Operation.—The successful cases are, I am sorry to say, much more easily disposed of. Gross says, for the operations for sarcoma, the results for the fourteen survivors of the operation were: one died of an unknown cause, one was living with recurrence at the end of four months, and five died of the disease in from five to eighteen months after the operation. Two were lost sight of; and five were alive and well at the end of seventeen, twenty-two, twenty-three, thirty-five months, and five years. The thirty-five months may fairly be stretched to three years, so that we may count two complete cures in the total number of cases. It is interesting to observe that not one instance of cure, or even of long relief, is recorded in the cases of children. Of the seven children who survived the operation, two were lost sight of, and four of the remaining five were alive or dead with recurrence within a year of the operation; only one living so long as eighteen months.

The results of the operations for carcinoma are even worse than those for sarcoma. Four patients recovered from the operation, of whom two died of secondary growths within two months of their recovery, one was alive and well at the end of two months, the other at the end of thirteen months.

Of the eighteen persons, therefore, who recovered from the operation, only two can be regarded as cured; for only two, both of whom had suffered from sarcoma, were alive and well at the end of three years after the operation.

The four patients (three of the sarcomatous, one of the carcinomatous) who were well at the end of from one to three years may undoubtedly be claimed to have been relieved by operation; but two cases of cure and four cases of relief are all that can be set off against twenty-nine deaths from operation, and nine failures.

Conclusions.—Nephrectomy for the removal of carcinoma has been so fatal and so thoroughly unsuccessful that the results do not appear to justify a continued trial of the operation.

Nephrectomy for the removal of sarcomatous kidneys in children has not been so fatal as for carcinoma in adults; but not one thoroughly successful result can be claimed, and it is probable the operation will fall into disrepute.

Nephrectomy for sarcoma of the kidney in adults has hitherto afforded the best results, but the successful cases are so few, and the mortality is so large, that the operation is not likely to find favour in the eyes of either surgeons or their patients.

I do not know whether there are any means by which sarcoma can be diagnosed from carcinoma in adults, and there are therefore no means by which the operation can be limited, as Dr. Gross seems to suggest, to the removal of the sarcomatous kidneys of adults.

CHAPTER XXIII.

BLADDER.

THE urinary bladder is subject to sarcoma and carcinoma. Both diseases commonly affect the wall of the organ deeply and over a more or less wide area. It is a rare circumstance for either of them to be pedunculated. During the past few years tumours have been removed on many occasions from the interior of the bladder, notably by Sir Henry Thompson (*Tumours of the Bladder*, 1884). In some of the cases in which an operation was performed, the tumour was found to be malignant, and as it was obviously impossible to remove it completely, it was partially removed or pared down level with the bladder-wall. One or two of the patients appear to have been relieved for a while, but the period of relief was so transient that the operation would probably never have been performed had it been evident, before proceeding to it, that the disease was malignant.

I know of only two instances in which a deliberate attempt has been made by excision of a portion of the bladder-wall to procure permanent relief from malignant disease. One is related by von Antal, of Budapest, in the *Centralblatt für Chirurgie* (1885, p. 617); the other was recounted by Sonnenburg, of Berlin, at the Fourteenth Congress of the German Society of Surgery, 1885 (*Beiträge zum Centralblatt für Chirurgie*, No. xxiv. 86). Sonnenburg's case may be taken first, for it is first in chronological order.

The patient was sixty years of age, had suffered for a long time from bladder-mischief, and during the last half-year from considerable losses of blood and violent pains in the region of the bladder. Digital investigation discovered a tolerably large tumour, the size of a five-shilling piece, in the anterior wall; it appeared to be seated in the substance of the wall. The incision for the high operation of lithotomy was practised, with the usual distension of the bladder and rectum. When the bladder was opened, it was found that the tumour was not so circumscribed as it had been thought to be, and that it would be necessary to remove two-thirds of the bladder-wall. The resection was nevertheless proceeded with; the tumour was removed piecemeal, and the peritoneal cavity was of necessity opened. The opened cavity was thoroughly cleansed, and the margins of the peritoneum were exactly brought together and sutured. The bladder, or what remained of it, was drained both through the urethra and the abdominal wound. It was, of course, impossible to bring together the cut edges of the bladder. After the operation there was absolutely no fever, but the patient died of exhaustion at the end of four weeks. At the autopsy it was discovered that a new bladder-cavity had been formed by the remains of the old bladder and the peritoneum, and that the cavity thus formed seemed capable of distension.

Von Antal's case is related at much greater length, and I shall use his description, liberally translating parts of it. His patient was sixty-one years old, and had suffered from bladder trouble for about two years. For a year past the urine had been bloody, and containing clots. There was also great pain and extreme frequency of micturition. "Combined" investigation discovered a tumour the size of a fist, in some places stony hard, with an uneven surface in the wall of the bladder. The bladder was generally freely movable, and there was no infiltration of the glands. The diagnosis lay between encysted stone in the summit of the bladder and an encrusted new growth. It was finally decided that the disease was an encrusted tumour.

The operation was performed on the 23rd of April 1885. The bladder was washed out with antiseptic fluid and filled with 250 c.cm. of salt water and the rectum was distended. In spite of these precautions, when the high incision was made there was scarcely any space between the upper margin of the pubes and the peritoneum.

After careful thrusting and holding up of the peritoneal fold, the bladder was opened by means of a 4 cm. long, flat funnel-shaped incision. With the fingers passed in through this opening, a tumour could be felt the size of a child's fist, crusted on the surface, easily broken down, nodular, closely connected with all the coats of the viscus. It was necessary on account of the clearly cancerous nature of the disease to resect the entire thickness of the bladder-wall; but the greatest care was taken not to open the peritoneal cavity, and so to prevent the entrance into it of breaking-down, gangrenous cancer-substance. In order to effect this the peritoneum was separated still further up, and in part from the posterior wall of the bladder, and was then held up and back while the summit of the bladder was cut around, so that the resection wound also took the shape of a flat funnel. The portion removed included one-third of the whole of the bladder-wall. During the operation seven bleeding vessels were tied in the bladder-wall with sublimate silk, and the ends of the ligatures cut short.

After cleansing the bladder and the interior of the wound, the edges of the resection wound were brought together with sublimate silk sutures; two bent hard gum-elastic catheters were fastened in the lower angle of the wound, and the bladder was kept under permanent irrigation with a solution of thymol. The edges of the wound in the abdominal wall were also brought together except at the inferior angle. The further course was completely free from fever. On the sixth day the permanent irrigation was discontinued: a Nélaton's catheter was introduced through the urethra and a long drainage-tube through the abdominal wall. The greater part of the urine escaped through the latter; on the twelfth day the tube was taken out. The fistulous opening completely closed on the 17th of June, after the prominent mass of granulations had been shaved off.

The patient, who was much better, could retain his urine, which was clear and without blood, for three or four hours without difficulty. The capacity of the bladder measured about 200–300 c.cm.

Von Antal rightly draws attention to his method of operating and to the advantages derived from separating the peritoneum from the surface of the bladder. If the operation is to be practised in the future for the removal of malignant growths of the bladder-wall, there can be no doubt that this is the method which must be employed.

I confess, however, I am not at all sanguine of the introduction of this operation into the realm of legitimate surgery, but am much more inclined to believe that, after it has been performed a few times, or possibly a good many times, it will take its place as a curiosity of surgery with many of the operations for malignant disease which have been introduced during the last few years.

At present the active surgery of cancer of the bladder merely amounts to this: two cases of resection of a portion of the bladder-wall, with one death and one recovery from the operation.

CHAPTER XXIV.

PENIS.

THE penis may be the seat of both sarcoma and carcinoma, but sarcoma of the penis is a very rare disease. Only a small number of cases is on record, not sufficient to make it worth our while to consider the course and treatment of the disease separately.

The form of carcinoma which most frequently occurs is squamous-celled carcinoma (epithelioma), which is probably five or six times more common than scirrhous and encephaloid together. It may attack the glans, the prepuce, or may infiltrate the whole thickness of the organ, and in the latter case may extend through the entire length of the penis, or may be limited to one particular part. The disease is rare in persons under thirty years of age, but after that age becomes more common during each decennial period. When a large number of cases is analysed, the disease appears to be most common between the ages of fifty and sixty and between sixty and seventy, and there appears to be a diminished liability to it after seventy years are passed; but the reason, which holds good in the consideration of the liability to cancer generally, is that the proportion of persons after seventy years of age to the total population is very small. In addition to age there can be little question that phimosis, whether congenital or acquired, predisposes to epithelioma of the penis.

The disease may commence as an ulcer, which may be mistaken for a venereal sore, and the error is only discovered by the deepening of the sore, and the extent and intensity of the induration by which it is surrounded. Or it may take the form of a warty growth, when it is exceedingly liable to be taken for a condylomatous mass: the actual nature of the tumour is discovered only by the surrounding induration, the ulceration which usually occurs early, and the absence of other signs of syphilis. When the disease affects the whole thickness or the substance of the organ, the diagnosis is usually more easily made; for, even if an ulcer is present, which is frequently the case, the induration of the penis is out of all proportion to the size and depth of the sore. In whatever manner the epithelioma commences, ulceration takes place almost invariably and at an early period; the epithelioma extends from one part of the organ to another, infiltrating the prepuce, the glans, the body of the penis; welding the different structures together and lending to them the characteristic hardness of the disease. In some instances the urethra is opened and fistulous passages result; in other cases the urethra is narrowed and encroached upon, so that the stream of urine is very slender and passed only with difficulty and pain. If the disease is left to itself it may extend to every part of the penis, may pass from the penis to the scrotum, and may even reach the perinæum and inner aspects of the thighs. Usually, long before this has happened, the glands in the groin are enlarged and hard, and are the seat of secondary affection. Like the primary disease, they, too, are liable to ulcerate with the production of horrible foul sores of considerable depth and extent. The pelvic and abdominal glands are often affected in a direct line from the glands in the groin; and at length the patient dies worn out by the extent of the disease, the size of the tumours produced by it, and the horrible ulcerations. The internal organs and distant parts of the body do not appear very liable to secondary affection; but this statement must be received with caution on account of the few instances in which death has been followed by a careful examination of the body. There appears, however, little reason to doubt that epithelioma of the penis is a local affection attacking the glands in the groin only after the primary disease has existed in most instances a considerable period, and certainly not affecting the other organs and tissues until late, if indeed at all. The duration of the disease without operation is very variable; it may terminate fatally in the course of a few months, or may last for many years. But the mean duration is said by Demarquay to be from two years to three years and a half.

The scirrhous and encephaloid cancers of the penis which have been recorded are very inferior in number, as has already been remarked, to the cases of epithelioma, and yet I am inclined to believe that the number has even now been exaggerated. It is certain that some instances of epithelioma in which the disease has formed a larger and more important mass than usual have been erroneously regarded as encephaloid cancer. And a similar mistake has been made in some cases in which there has been dissemination of the disease, because there is a general impression that epithelioma has no tendency to dissemination. It is very difficult to distinguish with the naked eye between epithelioma and encephaloid or scirrhous carcinoma, and in many of the recorded instances the microscope has not been employed in the diagnosis. It is, however, probable that both varieties of carcinoma do attack the penis. Clinically, there does not appear to be any essential difference in the course of the disease whether it is encephaloid, scirrhous or epithelioma. It may commence in the same part of the penis, pursue the same course, affect the groin glands, attack persons of the same age, and produce death in about the same time, no matter what the particular form of the disease. The encephaloid and scirrhous carcinomas are said to exhibit greater tendency to dissemination than epithelioma, but I do not know whether this opinion rests on sure grounds.

Methods of Operation.—It is rarely possible to remove a cancer of the penis by an operation of less magnitude than amputation, partial or complete, of the organ. Even in those cases in which the disease commences in the prepuce, it is seldom situated so far forward or diagnosed so early that circumcision suffices for its complete removal. When, happily, this is the case, there is every reason why this operation should be preferred to the mutilation produced by amputation.

For practical purposes, it will be convenient to separate the partial amputations, which consist of removal of the anterior portion of the penis, from the complete amputations, which may include not only the entire penis, but as much as is deemed necessary of the adjacent structures. The instruments which are employed, and the manner of operating, depend largely on the extent of the operation.

Partial Amputation.—Although various methods of cutting through the penis are described, such as amputation with the écraseur, amputation with the actual cautery, &c., only two methods are commonly practised at the present time. One is to remove the organ with the knife, the other with the galvano-cautery. Each method has its admirers, and perhaps each has its advantages, so both shall be described.

Amputation with the Knife.—The patient having been prepared for the operation in the usual manner, and anæsthetic having been administered, the seat of amputation, well behind the disease, is determined on. The operator seizes the end of the organ, the cancer having been first thoroughly cleansed and wrapped in a piece of lint soaked in carbolic acid, and draws it forwards so as to lengthen out the penis. An assistant is instructed to draw back the integument to prevent the removal of too large a portion. The section is then made with a long bistoury. The corpora cavernosa are cut through from the dorsal aspect, the corpus spongiosum being left till last. This is cut through on a plane anterior to the rest of the penis, so that it projects from the cut section. The vessels are tied with carbolized catgut or with silk which has been soaked in carbolic lotion, the wound is washed with carbolic or some other antiseptic solution, and may be dressed, for the operation is completed so far as the removal of the disease is concerned. But there is one thing which requires attention—namely, the management of the urethra, both for immediate and future purposes. Some surgeons introduce a catheter, made of gum-elastic or some still softer material, leave it in until the cicatrization is almost or quite complete, remove it, and advise the patient to maintain the orifice fully dilated by passing an instrument at intervals of a week or ten days. But I believe a far better plan is to draw forward the orifice of the urethra, incise it on the front and dorsal aspects to the depth of the eighth or a quarter of an inch, and fasten its margin to the cut margin of the skin on either side by means of four horse-hair sutures. A catheter may still be introduced for greater cleanliness and comfort in micturition during the first few days after the operation. I have employed this method, which I believe is due to Erichsen, on several occasions, and have been thoroughly satisfied with the result, which has been so successful that no precautions have been needed to maintain the orifice by means of instruments.

A very good flap amputation may be performed in the manner suggested by Professor Humphry (Holmes' *System of Surgery*, 3rd edition, vol. iii. 586). A flap of skin is cut from the dorsum and sides of the organ, and the dorsal arteries are secured. This flap resembles, in miniature, an anterior cutaneous flap in amputation of the thigh. The knife, a narrow-bladed one, is then inserted at a point on a level with the base of the flap, between the corpora cavernosa and the corpus spongiosum, and then is made to cut forwards, outwards, and downwards, for about three-quarters of an inch. From this smaller posterior flap the urethra is dissected out. The corpora cavernosa are then divided on a level with the base of the two flaps. The hæmorrhage is arrested and the urethra is brought out through an orifice in the face of the flaps, which are united at their edges. The urethra is split as was described in the last paragraph, and fastened to the edges of the orifice in the flap. This method affords, as the author says, an excellently covered stump. But it is useful, not only on account of the greater rapidity with which healing usually takes place, and of the more shapely stump, but on account of the diminished tendency to contract of the circle of skin around the end of the stump in an ordinary amputation, which leads in some instances to contraction of the orifice of the urethra.

Amputation with the Galvano-cautery may be performed with the Middeldorpf instruments and a medium-strength battery. Either platinum or steel wire may be used; personally I prefer steel wire on account of its durability, its less costly character, and its perfect efficiency. Piano wire answers the purpose admirably. The penis is included in a loop of the wire at the point at which the amputation is to be performed, and the same care is taken as when the knife is used not to cut the skin too short around the corpora cavernosa. The loop is tightened and at the same time heated, and as it cuts through the organ the tightening is maintained until the section is complete. It is of the greatest importance to regulate the degree of heat, which should not be so great as to make the wire white-hot. So great a heat causes the section to be very quickly made and vastly increases the tendency to hæmorrhage, which the use of a heated wire is especially intended to prevent or lessen as far as possible. A dull red-heat, or just so much more than a dull-red heat as is necessary to cut through the tissues, is the best. This degree of heat can be very easily arranged by means of the instruments which are at present employed for heating wire loops; and those surgeons who are accustomed to employ the galvano-cautery find no difficulty in controlling the heating of the wire. To those who are not in the habit of using these instruments, I would recommend that the first attempt should not be made in cases where it is of great importance to avoid hæmorrhage. A very little practice, however, serves to render the operator sufficiently a master of the instrument to perform such simple operations as the section of the penis. If the operation is successful there is no occasion to ligature any vessels, but the same care should be bestowed on the urethra as when the amputation is performed by the knife. It should be drawn forward, split, and its edge, after removal of the charred tissues, fastened to the edge of the integument.

For the better carrying out of this part of the operation, the wire loop may be passed through the penis between the corpora cavernosa and the corpus spongiosum and made to cut through the cavernosa only, the section of the spongiosum, from which only trivial hæmorrhage need be expected, being made with a knife or scissors.

The object of employing the galvano-cautery in amputation of the penis in preference to the knife is chiefly the avoidance of hæmorrhage, and to this point I shall return in the section of this chapter which deals with the results of operations.

In every simple amputation of the penis, whether performed with the knife or galvano-cautery or with any other instrument, the same precautions which are observed in the dressing and after-treatment of larger operation wounds should be rigidly carried out. The patients are often in a very unhealthy condition at the time of the amputation, and the shock and mental depression consequent on removal of this organ are in many instances out of all proportion to its insignificant size. The dressing of the wound is not easy on account of the variations in size to which the stump is liable, and the difficulty of fastening dressings on it in such a manner that they shall be maintained in position at all times of the day and night. The dressings, too, are liable to be frequently wetted by the passage of urine. I have tried several different forms of dressing with indifferent success, and have at length come to the conclusion that the most satisfactory method of managing the wound is to keep its surface frequently powdered over with iodoform, or, if iodoform alone is too irritating, with mixtures of iodoform and starch, or, better still, iodoform and borax. A cradle must be placed over the body of the patient to sustain the weight of the clothes, and, if the weather is cold, a blanket must be laid over the upper part of the body, another blanket over the thighs and legs; and at the same time it may be necessary to cover the stump with a piece of antiseptic gauze and a layer of cotton-wool. The gauze-covering should, if possible, be avoided, however, on account of the manner in which it tends to adhere to the surface of the wound and renders the application of fresh powder at frequent intervals difficult and painful.

Complete Amputation, or Extirpation.—Of the many methods by which the complete removal of the penis may be effected by the knife, I believe that none is better than that of P. Gould. It is described in the *Lancet* for 1882, i. 821, and provides for the maintenance of the orifice of the urethra and for the removal of the entire length of the corpora cavernosa. The manner of performing it is as follows:—

The patient having been prepared for the operation by removing the pubic and scrotal hairs and thoroughly cleansing the integuments with antiseptic solutions during several days previous to the operation, anæsthetic is administered. He is then placed in the lithotomy position and the skin of the scrotum is incised along the whole length of the raphé. With the finger and the handle of the scalpel the scrotum is divided into two halves quite down to the corpus spongiosum, which is thoroughly exposed. The separation of the two halves of the scrotum is effected with singularly little hæmorrhage. A full-sized catheter is passed along the urethra as far as the triangular ligament, and a knife is inserted transversely between the corpus spongiosum and the corpora cavernosa; the catheter is withdrawn and the urethra cut across. The deep end of the urethra is detached quite back to the triangular ligament. An incision is then made round the root of the penis continuous with that in the middle line, the suspensory ligament of the penis is exposed and cut through, and the penis is everywhere separated except at the attachment of the crura. Now follows one of the most tedious parts of the operation, the separation of the crura from the pubic bones, which is effected by means of a stout periosteum elevator. The hæmorrhage is usually trivial and the only arteries which require ligature are those of the crura; but the toughness of the tissues of which the crura are composed and their close adherence to the bone render the separation very slow and difficult. When the penis has in this manner been removed, the corpus spongiosum is slit up for about half an inch and the edges of the cut are stitched to the back part of the edges of the incision of the scrotum, so that the orifice of the urethra will in future be almost in the perinæum. The two halves of the scrotum are brought together, a drainage-tube having been placed deep down in the wound with its ends projecting at the front and back. It is not necessary to introduce a catheter. The dressing employed by Gould is an antiseptic absorbent cotton-wool pad, kept in place by means of a T-bandage.

Gould's method, which resembles in many respects those of Thiersch, Delpech, and Gouley, offers the advantage of an exceedingly good result, so far as the preservation of the urethra is concerned, and of being easily performed. It is, of course, in the manner in which I have described it in the preceding paragraph, suitable only for cases in which the disease is limited to the penis, and has not widely or deeply invaded the adjoining structures. By slight modifications it may be made to suit such cases if it is determined to operate upon them.

The Femoral and Groin Glands may be removed at the same time at which the penis is removed, if they are affected. The operation is quite separate from that for the removal of the penis, and may require a very extensive and delicate dissection, leading to exposure of the femoral vessels and crural nerve. If the glands are small and separate, or even large, but separate and not adherent to the surrounding structures, it is generally possible to remove them. If, on the other hand, they are matted together or adherent to the structures round them, it is very probable that an attempt to remove them will fail and have to be abandoned, unless the operator is prepared to cut away a portion of the femoral artery and vein, together with as much of the muscles and other structures as may be infiltrated.

Results of Operations.—*Mortality due to the Operation.*—Although it is possible to assemble a large number of figures showing the mortality of removal of the penis, there is nevertheless a good deal of difficulty in arriving at a correct appreciation of the results of operations. For two circumstances have to be taken into consideration: first, the extent of the operation, not only whether it involved a part or the whole of the penis, but whether it included the removal of the scrotum and testes, and also whether the groin glands were removed at the same time as the primary disease; second, the instrument with which the removal was performed. In spite of these difficulties, it is quite possible to arrive at some very definite conclusions, particularly with regard to the instruments.

Of the mortality due to mere amputation of the penis at any point between the end and the root, and performed with various instruments, but in the large majority with the knife, Demarquay shows in his tables (*Maladies du Pénis*, 1877) that in ninety-nine cases of which the results of the operation are stated, only four cases proved fatal, so that the general mortality of this operation is, according to his experience (derived from cases of his own and those which he had collected), just 4 per cent. The deaths were due to softening of the brain and abscess of the calf, to chagrin at the loss of the organ, &c., to erysipelas of the penis and gangrene of the scrotum, and to tetanus. Kaufmann, in the newest work on the diseases of the penis (*Deutsche Chirurgie*, Lieferung 50a, 1886), misquotes and misapprehends Demarquay's figures, and then takes exception to them. Demarquay distinctly states that four patients died of the operation. "D'après ce qui précéde, on voit que sur treize cas de mort, il n'y en a véritablement que quatre qui peuvent être mis sur le compte de l'opération, puisque dans toutes les autres observations la récidive de la maladie, le retentissement de l'affection sur l'état général, ou bien une maladie intercurrente ont amené la mort" (p. 482). Kaufmann's own figures give 180 cases with 161 recoveries, and nineteen deaths, a percentage of 10.55. The difference is so great that one cannot be surprised that Kaufmann should consider Demarquay's estimate too low. But when a close examination is made of the conditions of the operations in the two tables, and when other figures are used to correct the two estimates, I am sure it will be found that, for amputations with the knife at least, Demarquay is far more nearly in the right than Kaufmann. In his table of 180 cases, twenty-six of the operations were performed with the knife, with one death (from pyæmia); 117 were performed with the galvano-cautery, with sixteen deaths (thirteen from pyæmia and one from erysipelas); twenty-two with the écraseur, without a death; five with the thermo-cautery, without a death; and ten by means which were not stated in the reports. The table therefore gives a mortality of not quite 4 per cent. for operations with the knife, and a mortality of between 13 and 14 per cent. for operations conducted with the galvano-cautery. And if the operations performed with the knife and écraseur (cold instruments) are compared with those performed with hot instruments, the galvano- and thermo-cautery, the difference is even more striking—namely, forty-eight of the former with one death, against 122 of the latter with sixteen deaths. Kaufmann adopts a somewhat singular method of explaining the great difference in the mortality of the different operations, for he attributes it rather to concealment of the real results of knife operations than to a real difference in the methods. Speaking of the large mortality of the galvano-caustic operations, he says: "Allein man darf hiebei nicht vergessen, dass sie einmal ganz der Neuzeit angehört, wo man gewohnt ist, neben den Erfolgen auch die Misserfolgen ebenso gewissenhaft zu berichten, sodann aber prävalirt sie mit einer Frequenz von 66 p.c. über die sämmtlichen übrigen

Operationsmethoden. Bei den letzteren kann man sich des Eindruckes nicht erwehren, dass die von ihren Erfolgen eruirbaren Zahlen kaum den richtigen Verhältnissen entsprechen" (s. 291). In order to discover as far as possible how the matter lies, I have collected from various sources a number of cases of removal of the penis by different methods, taking the reports from many English and foreign sources as they come to hand. Nearly all the operations were performed with the knife, and the results are as follows:—Forty removals with the knife, with one death; four removals with the écraseur, with one death; total, forty-four cases, with two deaths. Six operations with the galvano-cautery, without a death; one removal with the thermo-cautery, which proved fatal; total, seven cases, with one death. The numbers are small, but, such as they are, they are very decidedly in favour of the cold instruments.

To discover how far Kaufmann's objection with regard to the intentional imperfection of the record may be true, I consulted two papers—one by Ressel (*Archiv. génér. de Méd.*, VIe. Sér. iii. 544; 1864), "De l'amputation du Pénis, par la méthode galvano-caustique;" the other an editorial paper in the *Medical Times and Gazette* for 1859 (ii. 334), "Report on Amputation of the Penis for Epithelial Cancer." The first deals with thirty-three cases of amputation of the penis performed with the galvano-cautery, and not only performed with the galvano-cautery, but nineteen of them performed by Middeldorpf himself, so that it is not possible to take objection to the operation on the ground that it was performed by persons who were not acquainted with the use of the instrument. Several of those which were not actually performed by Middeldorpf were performed in his presence and under his direction, yet five of the patients died of pyæmia. The second paper deals with thirty-five cases in which the operation was performed by various surgeons in different London and provincial hospitals, and only one of the patients died, the death being attributed to "a low form of pneumonia," which might of course have been pyæmic. Ressel explains the large mortality of the operations by the galvano-cautery in a curious manner, saying: "Nous n'aurions peut-être pas à noter un seul cas de mort si l'opération n'avait été pratiquée dans de mauvaises conditions à Breslau et peut-être aussi à Tubingue et à Vienne. En tous cas, nos cinq malades ne moururent pas de l'opération; mais, c'est leur présence dans les hôpitaux qui détermina la terminaison mortelle" (p. 698). Small consolation, I am afraid, to the patients and their friends.

In 1870–1, Zielewicz published in Langenbeck's *Archiv*, xii. 580, a continuation of Ressel's statistics, and found that fifty amputations with the galvano-cautery were productive of eight deaths, all from pyæmia, so that the first thirty-three cases produced five deaths; the second seventeen cases produced three deaths. Kaufmann now gives a grand total of 117 cases, of which the first fifty are probably derived from the papers to which I have referred, for the papers and their authors are mentioned by him, and the mortality is sixteen, nearly all, if not all, of them being due to some form of wound-poisoning, for those which were not directly due to pyæmia and erysipelas were due to tetanus, which is thought by some pathologists to be produced by the action of ptomaines. The percentage of the last sixty-seven cases is therefore better than of the first fifty, but it is still exceedingly bad, and the causes of death were much of the same kind. Ressel's objection that the mortality is to be ascribed to the condition of the hospitals cannot rightly be applied to the last fifty or sixty cases, for Kaufmann's statistics are no doubt carried up to date, and do not deal with operations performed only before the period of antiseptic surgery and improved hospital hygiene.

If any doubt still lingers in the mind with regard to the reliability of the statistics of amputations performed with the knife, it may be easily solved by reference to the statistics of the hospitals, which are published by authority and without the smallest desire to conceal the truth.

From the evidence which has been collected, and may without the least difficulty be multiplied, it is impossible to resist the conclusion that removal of the penis with the galvano-cautery (and I suspect with burning instruments generally) is attended with a much greater risk than removal with the knife or écraseur (in other words, probably with cold instruments). I cannot offer a very satisfactory reason for the difference which prevails, but suspect it is in some way connected with decomposition beneath the eschar, a decomposition which it is very difficult to prevent. I do not know whether larger or different clots of blood are formed in the cavities of the corpora cavernosa in operations with burning instruments, but I believe there is a greater tendency of the clots to decompose. Every surgeon knows how difficult, nay, almost impossible, it is to ensure a rigid carrying-out of antiseptic methods in the case of amputation of the penis; but it is much easier to keep the wound sweet and clean when the operation has been performed with the knife than when it has been performed by means of burning instruments.

I believe the chief reason for preferring the galvano-cautery or the thermo-cautery is that there is less fear of dangerous hæmorrhage during the operation, and a great deal is talked in papers and books about the importance of the hæmorrhage and the difficulty of arresting it. It is, however, a very significant circumstance that no death from hæmorrhage is reported in any of the cases related in Demarquay's tables or in any of the cases I have collected. I have myself several times amputated the penis, and have seen it performed by other surgeons still more often, but have never on any occasion seen hæmorrhage which gave serious trouble or which caused the least anxiety to the operator; and I therefore believe that the danger of hæmorrhage has been exceedingly exaggerated. Kaufmann holds very curious views of the applicability and the advantages of the different methods of operating. He says that the possibility or impossibility of narcosis (s. 289) decides the method. For all cases in which narcosis is to be feared, or is generally inapplicable, the galvano-caustic operation is the best and simplest method. Without for a moment underrating the dangers of narcosis, I must yet confess that the occasions within my knowledge in which it has not been possible or expedient to administer an anæsthetic for any operation on the external parts of the body, have been so few that if the use of the galvano-caustic were limited to such occasions, it would be very seldom called for in cases of amputation of the penis.

The causes of death in the fatal cases, in whatever manner the operation has been performed, have been almost always pyæmia, septicæmia and erysipelas, in fact what are generally regarded as blood-diseases. The reason for this is probably the fact that the spaces of the corpora cavernosa become filled with blood-clot, and that the clot is prone to decompose on account of the great difficulty of maintaining a sweet and healthy wound. There is good reason to hope that the mortality may be diminished by the use of iodoform and similar powders frequently applied to the surface of the wound; for a mortality of even 4 per cent. is a large mortality for so small an operation as the mere amputation of the penis.

Of the mortality of the larger operations practised by Thiersch, Gould, Delpech, and Gouley, to which the name "extirpation of the penis" has been applied, we have some, but a limited knowledge, on account of the comparatively small number of instances in which they have been required or performed. I have collected fourteen cases in which the operation has been performed by Thiersch, Gould, Mac Cormac, Puzey, and other surgeons, and there was not one death in the fourteen cases, although the operation was performed on more than one patient of seventy years of age and upwards. It is of course improbable that a larger series of cases would be equally happy. Some of the fourteen cases were almost certainly published on account of the successful issue of the operation. I have not separated those operations which included the removal of the scrotum and testes from those which were solely concerned with the removal of the penis in its entirety, nor have I said anything with regard to operations for the removal of the inguinal glands. The impression I have derived from a consideration of the removal of the penis in its entirety is that, although the operation appears to be much larger and more difficult to be borne, it may nevertheless not really be a more fatal operation than the simple cutting off of the penis. In the larger operation the whole of the corpora cavernosa are removed, and the collection of blood-clots and the decomposition in the spaces of the cavernosa, which has been alluded to as a possible source of poisoning, may by this means be prevented.

Of the danger of removal of the inguinal glands, whether the removal be made a part of the primary operation or is performed as a separate operation, I have no statistics; but the operation may certainly be expected to add to the danger, if only in a small degree. I have myself, on more than one occasion, removed a large number of inguinal glands from the groin, in cases of epithelioma of the penis, and, although the patients recovered, the recovery was slow, for the dissection had passed down to and around the femoral vessels.

Cures effected by Operation.—Demarquay, who occupies many pages of his work with a consideration of the treatment by operation of persons affected with cancer of the penis, has scarcely a word to say of the ultimate fate of those who were treated; and yet his tables contain several very successful cases. As a rule, the termination of each case is written "guérison," but that refers only to the immediate results of the operation. But, if all the cases are taken in which the result was known, or practically certain, there are about twenty-seven of them. I cannot be quite sure of the number, on account of the existence in several places of marks signifying "ditto," where it is very probable, nay almost certain, that the preceding statement was not intended to be repeated. In consequence of this inaccuracy, more deaths might be detected in the tables than actually occurred. As far as I can make out, eighteen persons died either of the results of the operation, of some intercurrent malady, of recurrence of the disease, or of glandular affection; two persons were alive some time after the operation, but were suffering from recurrence; and seven persons were known to have lived and remained free from disease for a more or less considerable period. The duration of this period was eighteen months, two years, four years, four years, "several years," six years, and ten years. Five of the twenty-seven patients may therefore be fairly claimed to have been cured by the operation, a percentage therefore of rather more than eighteen.

In the seventy-three cases which I have collected from various sources, and in which very few of Demarquay's list are included, for mine are taken from more recent literature, the results are followed up in a much larger proportion of the cases. An account is given of thirty-two of the patients, of which thirteen are classed as suffering from epithelioma, nineteen from carcinoma or cancer. As they were not nearly all verified by microscopical examination, the division cannot be held to possess a scientific value, and it is more than probable that many of the cases of disease which are set down as carcinoma or cancer, were cases of epithelioma. Of the thirteen cases of epithelioma, six were known to have terminated fatally, or were suffering from recurrence or affection of the glands, which was certain to terminate fatally within a few weeks or months. Seven of the patients were alive and well, or had died of some other cause than cancer, at periods respectively of one year, two years and four months, three years, four years, six years, eighteen years, and eighteen years. Of the nineteen cases of carcinoma, eleven terminated fatally, or were certain shortly to terminate fatally, and eight recovered, and were alive and well at the end of twelve months, seventeen months, twenty-one months, two years, three years, six years, six years, and seven years. Of the whole thirty-two cases, therefore, seventeen terminated fatally, either from causes connected with the operation or from recurrence or secondary disease, or were known to be dying; and fifteen terminated so far successfully that the patients were alive and well at least a year after the last operation. Nine of the fifteen can be regarded as cured on the three years' limit; a percentage, therefore, of more than twenty-seven. The percentage of complete recoveries is decidedly larger than that gathered from Demarquay's tables, and this must be regarded as a peculiarly auspicious circumstance, for not only is the number of completed observations larger, and proportionately very much larger, but the diagnosis was in a much larger number of instances confirmed by microscopical examination. I have not of course taken into account the few operations which were merely palliative, cases in which the patients were already suffering from secondary disease so extensive that it was beyond the reach of operative surgery.

A study of the cases which were cured, or which bade fair to be cured, will well repay operators. There is not one of them in which the lymphatic glands were removed either at the time of the primary operation or later. There are, however, two or three cases in which there was enlargement of the groin glands at the time of the operation, where it was doubtful whether the enlargement was cancerous or not, but the glands subsided after the removal of the cancer of the penis. In seventy-three cases, I have notes of eight which included removal of the glands. The later result was not known in two of the eight; the remaining six died either of the operation or of recurrence. Kaufmann says that he has collected fourteen cases of amputation of the penis and excision of diseased glands. The history of thirteen of these cases is: four were fatal from wound complications (erysipelas, one: trismus and tetanus, one; pyæmia, two); five were fatal within a short period, from recurrence in the groin scar; and the report of the remaining four tells only that they were recoveries from the operation. In addition, therefore, to confirming the impression which my eight cases produce of the very unfavourable prognosis so far as ultimate cure of the patient is concerned, Kaufmann's cases lead us to believe that a large mortality may be expected from the double operation.

With regard to the duration of the disease at the time of the operation in the successful cases, the histories tell that it had already existed in several of them for a considerable period; so that, while some of the patients were subjected to operation within two or three months of the first appearance of the disease, others of them were not treated until from one to two or three years had elapsed. Here, again, is an illustration of the fact that long duration of a malignant disease, if it be associated with small extent of the tumour and a healthy condition of the neighbouring lymphatic glands and distant parts of the body, is a favourable circumstance in the prognosis.

With the duration in the successful cases the extent of the disease is worthy of consideration. In nearly every instance it was the glans and prepuce, or one of them, which was the affected part; so that the operation which sufficed was a mere amputation of the projecting portion of the penis. In two cases the disease commenced in the prepuce, which was removed; recurrence took place and amputation of the penis was performed. In the one case this sufficed for the cure of the patient; but in the other a second operation at a higher point was required before the progress of the affection was arrested. Complete extirpation of the organ was only performed in two or three cases.

Are patients who are not cured, benefited by operation? With this question must be associated that of the *condition* of persons who have been cured by operation, for the removal of the penis is a very different matter from the removal of the breast or a portion of the lower lip. In the first place, there is the question of the power of micturition. The evidence on this matter is very conflicting, but there can be no doubt that some patients suffer considerable difficulty in passing water, while other patients are not in the least degree inconvenienced by the removal of the penis. A great deal is said of the necessity of cutting through the corpus spongiosum (and therefore the urethra) in front of the level at which the corpora cavernosa are divided. From my own experience I should say this is not essential. I have removed the penis at various points in front of the level of the pubes. In one or two cases I have made the incision oblique from behind forwards, and from above downwards. But in every instance after the amputation I have split the orifice of the urethra for a short distance, and have fastened the edges of the split urethra to the integument. I have had the opportunity of observing some of these patients for upwards of a year after the operation, and have been pleased to find that there has not been the least difficulty in micturition. In those cases in which the penis has been extirpated and the urethra has been turned down into the perinæum, I cannot find that there has been any difficulty in micturition, for the only complaint has been that the patients are obliged to sit in order to pass water.

It appears much more likely that difficulty of micturition would result from operations conducted by means of burning instruments, when there are not the same facilities for dealing with the orifice of the urethra; but in the large majority of these the records do not tell of any serious trouble, or of even great discomfort.

The second question is the power of begetting, a matter of very secondary importance when compared with that of micturition. On this question there is not very much evidence at hand, but there is enough to show that amputation of the penis at the junction of the middle and distal third, or at the middle, does not necessarily destroy the power of coitus and begetting. Of course, amputation at the pubes or the extirpation of the organ acts as a complete preventive; and the question has been raised, with regard to the latter operation, whether it would not be better to remove the testes when the scrotum is split down the middle in order to relieve the patient of organs which are not only useless to him in future, but may cause him very great discomfort. It seems scarcely right to subject patients to so severe an extension of the operation for such a purpose, and I doubt that the feeling of most surgeons will be in favour of such a proceeding.

So far as the benefit of patients who are not cured by operation is concerned, I am quite certain that many of them derive the greatest advantage from the removal of the disease; particularly those persons in whom the disease is so situated that amputation of the organ can be performed in front of the pubes with almost absolute certainty of preventing recurrence in the stump of the penis. Some of these patients are already suffering from such extensive affection of the groin glands that it is hopeless to attempt to remove them; but the operation frees them from the encumbrance of a mass of disease which is often very foul, is sometimes exceedingly painful and very tender, and which may be the cause of great distress in micturition. Two cases in my own practice offer examples of the benefit derived from operation by patients who could not be claimed as cured. One of these was an old man with extensive disease, which necessitated amputation quite up to the pubes. While the wound was healing, recurrence appeared in the midst of the granulations, and the recurrent button was removed. He recovered and returned to his work. At the end of many months—nearly a year—I operated for the removal of a small mass of enlarged glands in the left groin; but there was no recurrence in the stump, and he had been in good health and in the enjoyment of great comfort ever since the removal of his penis. The second patient was a comparatively young man, not more than thirty years of age, whose penis I amputated, and from whose right groin at the same time I removed a large number of hard glands. The dissection was difficult and passed beneath the femoral vessels. He slowly recovered and returned to his employment. At the end of from two years to two years and a half he came back with recurrence of the disease in the right groin and with enlargement of the glands in the left groin. The enlargement had very slowly taken place, but had evidently been taking place during a long period; but there was not any recurrence in the stump of the amputated penis. These two are only some of many instances which could be adduced to prove the advantage of such palliative operations. The first was of course not performed as a palliative operation in the first instance, but it is probable it will prove to be only palliative from what is known of its later history.

I believe that *extirpation* of the penis may also be performed, in some instances with great advantage, merely for palliative purposes.

Conclusions.—Amputation of the penis, performed for cancers limited to the end of the organ, when there is no glandular or other complication, may be performed with a good prospect of success.

The operation should not be performed with burning instruments on account of the large mortality which has hitherto attended their use.

If the amputation is made with the knife, the mortality is small; and if the edges of the urethra are united to the edges of the integument, there is little fear of subsequent difficulty in micturition.

The amputation should be performed well beyond the disease.

The prognosis is very bad when there is already affection of the groin glands, or if the glands become affected after the removal of the penis.

Extirpation of the penis may be performed for extensive disease affecting the body of the organ without (so far as is known at present) a large mortality from the operation; but the prognosis, so far as cure of the disease is concerned, is not so good as that of mere amputation of the penis for disease situated at or near the extremity.

Palliative amputation, and probably extirpation, may be performed with advantage in many instances in which the situation or extent of glandular or other disease renders an attempt at complete cure hopeless.

CHAPTER XXV.

SCROTUM.

ALTHOUGH occasional examples of other varieties of cancer have been described in the scrotum, the only variety which is common in this part of the body is squamous-celled carcinoma or epithelioma. And this disease is in fact common only among the men of a peculiar calling, to wit, chimney-sweeps. The occurrence of cancer of the scrotum is so nearly limited to sweeps that it is often called "chimney-sweeps' cancer." On many accounts it has an important bearing on questions relating to the pathology of cancer, and I would fain spend some time and space in discussing the features of the disease; but there is no reasonable excuse for doing so in this place. I shall therefore merely draw an outline of the course of the disease, as in the malignant diseases of other organs and tissues, and shall only so far draw attention to the peculiarities of soot-cancer as to say that it is scarcely known in other countries than England, and that all our information on its course and the methods and results of treatment must be derived from the reports of English surgeons.

The cancer may commence on any part of the scrotum, but affects generally the lower and front part; it occurs in men, and is rarely seen before the thirtieth year has been passed; and its occurrence is usually preceded by the formation of one or more warts on the scrotum. The scrotum may, indeed, be covered thickly with these flattened warts, which are well-recognised pre-cancerous conditions. Such a wart may break down shortly after its first appearance, and become cancerous; or the scrotum may have been the seat of warts for many years before one or more of the innocent warts develops into cancer. The manner in which one of these warts becomes cancerous is usually by extending, ulcerating, and becoming indurated at its base. The process is sometimes rapid, but more often slow; if left to itself, the disease may extend over a large part of the scrotum, infiltrate the whole thickness of the scrotum, produce adhesion of the tunica vaginalis and the testicle, and ulceration of the testicle. Or it may affect the root of the penis and destroy the organ in large part. From the scrotum it may reach the perinæum, the inside of the thighs, the skin of the abdomen. But before or without attacking these parts, it may affect the inguinal lymphatic glands, and these may in the course of time break down, like the primary disease, and form large and deep foul ulcers. From the inguinal the epithelioma may extend to the glands within the pelvis and abdomen. The patients at length perish from exhaustion.

There appears to be very little tendency to the production of secondary affection of the internal organs or distant parts of the body.

It is not easy to estimate the natural duration of soot-cancer, for the primary disease is removed in very many instances. But there can be no question that it may be very protracted, and may last over several years, although many of the subjects of it are carried off in far less time than this.

It has been stated in several works on surgery that this disease is gradually disappearing from England, owing to alterations in the method of sweeping chimneys and to the greater precautions which the sweeps take against the formation of the cancer; but the authority on which this statement rests is very doubtful, for the Reports of the Registrar-General tell a very different story.

Methods of Operation.—Small epitheliomata of the scrotum are usually cut out by making an elliptical incision which shall include the disease and the parts immediately around it, care being taken to remove a sufficient area of apparently healthy tissue. The incision should penetrate the whole thickness of the scrotum. After the arrest of hæmorrhage and the thorough cleansing of the wound, its edges may be brought together by means of wire or horse-hair sutures. There is not the slightest difficulty in accomplishing this, even when a large fragment of the scrotum has been removed, on account of the elasticity and capacity for stretching which the integuments possess.

It is not possible to describe with advantage the operations which are practised for the removal of those much more extensive examples of the disease which implicate the deeper parts, for the operation depends directly on the extent and situation of the disease and on the organs and tissues which are affected. Operations are described in which the entire scrotum, the testes, penis, and a portion of the skin of the perinæum, as well as of the inside of the thighs, have been removed, and other operations where, in addition to the removal of extensive epithelioma of the scrotum, the glands in one or both groins have also been dissected out. It is obvious that no set operation will meet such cases as these, and that the operator must decide for himself what he will remove and how he will proceed to do it.

In the performance of all these operations, whether of small or large extent, the hair should be shaved off, and the parts carefully cleansed by repeated washing with antiseptic solutions, or the application to the scrotum of cloths soaked in an antiseptic solution for several hours before the operation. The Listerian antiseptic dressing may be applied, but is not easily maintained in place.

Results of Operations.—Our knowledge on this head, whether we consider the immediate or the remote results of operations for cancer of the scrotum, is lamentably defective. I am not aware of, nor have I been able to discover, any papers which contain reliable information with regard to the prospect of cure by operation. There prevails a general impression that cancer of the scrotum is not a very malignant disease, and that the probability of permanent success from operation is really much greater than for most parts of the body. On this and other matters connected with chimney-sweeps' cancer, some very curious if not complete information may be obtained from several sources.

First, there is the Supplement to the Forty-fifth Annual Report of the Registrar-General of Births, Deaths, and Marriages in England (1885). Referring to Table K, on page xxx. of "Causes of Deaths of Males, aged 25–65 years, in different industries: being samples abstracted from the Death Registers of 1880–1–2," the Registrar remarks at page lvi.: "Chimney-sweeps.—The death-rates in this industry are lower than in the previous record, but still are excessively high, and give a comparative mortality figure of no less than 1519. It is true that the rates are based on comparatively small numbers, but the agreement of the testimony of the present with that of the previous record leaves no fair doubt that the mortality of chimney-sweeps is terribly high. Judging from the 242 deaths of which the causes were ascertained, an excess of mortality prevails under nearly all the chief headings, but the number is too small for trustworthy inference. There is, however, one cause of death which, though it does not appear as a separate heading in the table, yet requires special attention as being notoriously common among chimney-sweeps—namely, cancer. Of the 242 deaths of chimney-sweeps of which the causes were ascertained, no less than forty-nine were due to some or other form of malignant disease; this gives 202 from this cause to 1000 deaths from all causes, whereas the proportion of deaths from malignant disease to deaths from all causes among all males of from twenty-five to sixty-five years of age in England and Wales is only 36 in 1,000: so that, even if the total mortality of sweeps were simply equal to that of all males, their mortality from malignant disease would be more than five times as much as the average. But the total mortality of chimney-sweeps, as shown by their comparative mortality figure, is 50 per cent. higher than the average, so that the liability of chimney-sweeps to malignant disease is about eight times as great as the average liability of all males. These figures scarcely support the belief expressed by some authorities, that improvements in the art of sweeping and habits of sweeps have caused this disease to be comparatively infrequent among them.

"The organs affected in the forty-nine cases of malignant disease, the precise nature and site of which were not always stated, were as follows:

"Scrotum, penis, testis, groin	23
Lip	1
Face	2
Orbit	1
Palate	1
Neck	1
Stomach, liver	7
Organ affected not stated	13
	49."

It will be seen that the term chimney-sweeps' cancer in the Report of the Registrar General is not confined to cancer of the scrotum, and the above figures refer to every instance of cancer which was known to have occurred among sweeps. Studying the figures more carefully, with the object of discovering how far the disease could be attributed to the employment of the individual, we may probably exclude the cancers of the palate, orbit, stomach, and liver (nine cases), for the soot could scarcely be credited with having directly influenced the health of these organs. The large number of cancers of the stomach are more probably due to the custom which prevails largely in the trade of drinking strong drinks. Of the thirteen cases in which the affected organ was not stated, it is almost certain that a large proportion were cases of cancer of the scrotum, and it would probably be a moderate computation to attribute eight of the thirteen deaths to this cause. This would give a total of thirty-one cases of fatal disease of cancer of the genital organs in sweeps in the course of the three years (1880–1–2).

In order to obtain some idea of the number of cases of cancer of the scrotum treated in the hospitals, I have looked through the statistical tables of those of the London hospitals which I could gain access to. The libraries which I use contain incomplete series of the tables of the Middlesex, St. George's, St. Bartholomew's, University, Westminster, St. Thomas's. The complete series of four of these tables during the years 1879–80–81 (which may be taken to correspond more nearly with the above numbers than the tables of 1880–1–2) show that ten patients were treated in these hospitals during the three years—a very large number when compared with the total number of thirty-one fatal cases taken from the whole of England, for it probably refers only to a part of London.

Again, taking the Reports of the Registrar-General for separate years, and comparing with them the number of cases treated in the year or two years previous in those hospitals of which the records are within my reach, I find that there were thirteen fatal cases registered in the whole of England and Wales during the year 1876. During the year 1875 St. George's treated two cases; St. Thomas's, no cases; St. Bartholomew's, six cases; Middlesex, no cases—total, eight cases. The deaths in the Registrar-General's Report for 1879 number eight. Five hospitals in 1878 record six cases—namely, Middlesex, two cases; University, one case; St. Thomas's, no cases; St. George's, one case; St. Bartholomew's, two cases. The Report of the Registrar-General for 1880 shows five deaths. Four hospitals in 1879 show: St. Thomas's, one case; St. Bartholomew's, three cases; University, no cases; Middlesex, no cases—total, four cases in four London hospitals.

These numbers are not selected, but are taken at random, just as I found them to hand; but they show one thing very clearly—namely, that the number of cases treated throughout the country must be largely in excess of the number of persons dying of the disease, and therefore it is not unfair to assume that a goodly proportion of sweeps who are treated by operation are cured of their disease.

On the other hand, if we examine the Reports of the hospitals to see how many men die in them of cancer of the scrotum, or secondary affection due to primary scrotal cancer, we shall find that the account is too flourishing, and I shall require to correct it by the Reports of the Registrar-General. In the course of ten years three patients were treated at St. Thomas's, and all recovered. In four years two patients were treated at St. George's, without a death. In ten years University Hospital had two cases of operation, of which one was fatal. The Middlesex, in eight years, had four cases, with four recoveries; and St. Bartholomew's, for eleven years, treated twenty-seven cases, with twenty-six recoveries and one death. The total of these five hospitals is thus thirty-eight cases, with thirty-six recoveries and two deaths. One fact is clear, that the operation of removal of cancer of the scrotum is not a very fatal operation, for the mortality is scarcely more than 5 per cent. Of course, statistical tables do not tell of the relative severity of the operations which were practised, whether they merely involved the removal of a small portion of the scrotum, or whether they were such extensive operations as are from time to time described, and included, in addition to the removal of all the appendages, the dissection of the inguinal glands. In addition to those persons who were treated by operation, there were, during the same years, in the same hospitals, some half a dozen men whose cases were not deemed suitable for operation, and who were consequently discharged from the hospitals to die in the infirmaries or at home. These hospitals have therefore only two deaths to show during this period. But I have no doubt the Registrar-General would show at least seventy deaths from cancer of the scrotum during a period of ten years, and this would be below rather than above the mark, for the Returns of the Registrar-General are not of the most accurate description, and in such cases are likely to err on the side of too few numbers than on the side of too many.

The foregoing figures do little more than whet the desire for more information on the subject of scrotal cancer. They show how curiously uneven and imperfect the record is. They do tell, what indeed might have been foretold, that the disease may be removed without a large mortality; and the record of an individual instance here and there will also show how large an operation some men will bear on this part of the body without a fatal consequence. They also tell that a great many more sweeps suffer from cancer at the present time than we are at all disposed to believe, and still further, that there are many more fatal cases of scrotal cancer in sweeps each year than we should suspect from the statements which are made from time to time by surgical writers, who speak of the decline of the disease as if it were actually disappearing from our midst.

CHAPTER XXVI.

TESTIS.

Both sarcoma and carcinoma attack the testicle, but cases of sarcoma are more numerous than cases of carcinoma. Although there are differences between the two diseases, especially in regard to the age at which they may occur and the mixture of other tissues with the naturally soft structure of the sarcoma, these differences are not so considerable that they need be taken into account in the question of operation. It may, however, be mentioned that although both diseases are usually found in persons over thirty-five or forty years of age, yet sarcoma is not uncommon in boys under ten years old; and that cartilage, which is frequently mingled with the tissues forming sarcoma, is never found in carcinoma. Further, the affection of both testes has only been known to occur in cases of round-celled sarcoma.

Malignant disease of the testis, then, may occur in children and in adults, but seldom occurs in children after ten years, and rarely in adults under thirty years of age. It usually affects only one testis, but occasionally attacks both, either simultaneously or after a more or less prolonged interval. The tumour appears to attack the entire body of the organ and produces general enlargement, which takes place almost always continuously, though the rate of progress may differ much in different instances. So may the size attained by the tumour, for sometimes death has occurred from generalization of the disease while yet the primary growth is comparatively small; in other instances the primary tumour has attained a very large size, and many pounds in weight. The enlarged testis may become adherent to the scrotum, and ulceration may ensue with the production of fungus testis; but this is a rare event. In some cases the disease spreads up the cord to the pelvic and abdominal glands, and the thickened cord can be plainly distinguished passing up through the internal ring. But the glands may be affected without any very marked enlargement of the spermatic cord; or perhaps it would be more correct to say that the cord, though slightly enlarged, need not contain any actual disease, but may be practically healthy at the time of the removal of the testis, and may remain healthy, while the glands may slowly enlarge and form huge masses of cancer in the pelvis and abdomen.

Generalization may take place in the lungs, the liver, and other organs; the round-celled sarcomas especially are associated with secondary growths in many parts of the body.

The duration of the disease is liable to great variation; its natural duration is of course affected by the operation of castration, for very few cases are allowed to run their course without operation. Some of the patients have been destroyed by the disease in the course of a very few months; others have been operated on after the tumour of the testis has been observed for two or three years, and have lived for several years after the operation. The operation of castration may be successful in preventing recurrence of the disease in the cord or scrotum, although it may not be performed in time to save the life of the sufferer, who may die of secondary affection of the lymphatic glands and other organs.

It must not be forgotten that retained testes are quite as liable, if not more liable, to malignant disease than naturally placed testes.

Methods of Operation.—It is of course possible to destroy a malignant testis by means of caustic, but I can scarcely imagine a surgeon seriously proceeding to do so. Ligature of the spermatic artery has been practised in a few instances with alleged success, but the strong probability is, that a tumour which has subsided after this operation was not a malignant tumour.

The operation of castration, or excision of the testis, is the only operation which offers a reasonable prospect of success, and although this may be performed with the galvano-cautery, the much greater ease with which it can be performed with the knife, and the certainty with which hæmorrhage can be controlled by means of clamp-forceps or immediate ligature of bleeding vessels, render the operation with the knife acceptable to almost every surgeon, even in cases in which the patient is weakened by the disease or of naturally very feeble constitution.

Every care should be taken to provide for the perfect cleanliness of the parts before the operation; and with this object, the pubes and scrotum should be closely shaved, and after repeated washing should be kept covered, for twenty-four hours immediately preceding the removal of the testis, with lint soaked in a solution of carbolic acid or some other antiseptic. (The presence of a hernia on the affected side should be ascertained, if possible; for although it does not contra-indicate operation, greater care is requisite in dealing with the cord in order to avoid opening the hernial sac. If the sac is opened, the contents may be returned, and the sac ligatured high up and removed below the ligature.) The patient is placed under the influence of an anæsthetic, the thighs are abducted and everted, and a sponge is placed in the perinæum. An incision is made from just below the external abdominal ring down to the lowest part of the scrotum, which is tensed by drawing it tightly over the tumour. The integuments are divided down to the tumour, which is exposed in the first cut, and is dissected out without difficulty. The spermatic cord is also dissected out as high up as is deemed necessary. At the highest point it is grasped by the fingers of an assistant, or, better still, with a strong pair of clamp-forceps, which holds it so firmly that, when it is divided, the vessels shall not bleed. It is then cut through, and the vessels are tied separately. The stump of the cord is next nipped on either side with Wells's clamp-forceps, to prevent it from slipping back into the abdomen; the large clamp-forceps are removed, and the surface is carefully examined to make sure that the vessels have been tied. If there is no hæmorrhage, the clamp-forceps may be taken off and the stump allowed to recede. If the vessels in the scrotum have not been ligatured before the removal of the testis, they must now be tied. The wound is then thoroughly cleansed with antiseptic solution, the edges of the incision are brought together with silver wire or silk sutures, and a drainage tube is inserted at the lowest part of the scrotum. A little iodoform may be sprinkled over the skin, or the dressing may be carbolic lotion, or sanitas oil or lotion, or any other application which the surgeon is in the habit of employing. When the patient is put back in bed, the scrotum should be supported by means of a small pillow or pad of absorbent wool. One of Gamgee's antiseptic pads will answer the purpose well. Healing is usually completed in the course of two weeks, although sometimes it is delayed by inflammation and suppuration about the stump of the cord.

The method which has been just described is the best for treating an uncomplicated case. The ligature of the cord *en masse*, which was at one time practised, finds very little favour at the present time. The advantage which is afforded of permitting the operation to be rapidly completed offers no inducement in these days of anæsthetics. The inclusion of the nerves in the ligature is said to be, and no doubt really is, a source of pain, and there is certainly no reason for using such a ligature for the arrest of hæmorrhage from such small vessels as those of the spermatic cord.

Skin which is adherent to the tumour must be removed freely. The prognosis in such cases is much worse than in those in which the skin is natural; for, in addition to the increased danger of local recurrence, there is great probability of affection of the inguinal glands as well as those in the pelvis and abdomen.

If the cord is obviously affected up to and beyond the external ring, it may be followed as far as or beyond the internal ring, if it is thought desirable to operate under such circumstances, when the lymphatic glands are almost certain to be affected, and there is little prospect of averting a recurrence *in sitû*.

A cancerous retained testis may be removed with the same hope of curing the patient of the disease as if the testis were situated in the scrotum, but much greater care is needed in deciding whether it is expedient to perform an operation or not. It is not easy to determine in all cases whether the tumour is free from the surrounding tissues, and the condition of the cord may be a matter of the greatest uncertainty. The operation is conducted much in the same manner as when the testis is removed from the scrotum, except that a longitudinal incision is made in the long axis of the tumour, and greater care is needed in the dissection. The cord and its vessels are dealt with in the manner which has been described.

The lymphatic glands of the pelvis and abdomen, if they are known to be affected, may be removed—or at least an attempt may be made to remove them—by following the cord up into the cavity of the abdomen, raising the peritoneum, as in the operation for ligature of the iliac arteries, and exposing the tumours. But the improbability of being able to remove all the affected glands, the possibility that they may have contracted adhesions to the surrounding structures (perhaps to the large veins and arteries), and the very small prospect of being able to cure the patient, while there is a very great prospect of killing him, do not invite surgeons to undertake this operation.

Results of Operations.—*Mortality of the Operation.*—The largest tables with which I am acquainted of cases of malignant disease of the testis are those published in *Sarcoma and Carcinoma* (London, 1882). Taking only the cases in which the operation of castration was performed, there are nineteen of carcinoma and thirty-seven of sarcoma. To these I have added, collected from various sources, eight cases of carcinoma and thirty-five of sarcoma, so that the total number amounts to one short of one hundred. The total mortality of the ninety-nine cases was four from causes more or less directly connected with the operation. I do not know what the immediate cause of death was in all of the four cases; but in two of the four patients who died there was already secondary disease at the time of the operation, probably of the abdominal glands in both, and certainly of the omentum in one. In the former, peritonitis was the actual cause of death, but there was no evidence of the manner in which the peritonitis was connected with the operation, for the peritoneum was not known to have been wounded during the removal of the testis. I believe that a mortality of 4 per cent. is larger than need be expected at the present time, for there is a remarkable difference in the results of the first fifty-six operations and of the forty-three which I have since collected. All four of the fatal cases occurred in the first fifty-six cases, and in the forty-three collected since there was not one case which terminated fatally. This series of cases is collected from records of the last five years; the first series runs back for fifteen years or more, and two at least of the fatal cases occurred between thirteen and fifteen years ago. It is therefore not unreasonable to hope that a smaller mortality may be obtained for the operation of castration in the future.

As I was not quite sure whether the cases which were reported to some of the Societies were reported sufficiently long after the operation to allow of a complete recovery, I took the statistical tables of St. Bartholomew's Hospital which I have by me. They show that during the last fifteen years the operation of castration has been performed forty-seven times, either for malignant or innocent tumours or for strumous disease. In the forty-seven cases there was only one which terminated fatally from causes connected with the operation, so that the mortality practically is only just over 2 per cent. I believe this will be found to represent the actual mortality of the operation more correctly than the 4 per cent. which is derived from the one hundred cases which I have put together. I have used the round number, one hundred, with intention, for it is more than justified by the fact that several of the patients suffered removal of both testes at two separate operations.

Cures due to Operation.—Nothing in connection with this subject is more exasperating than the number of instances in which the patients have been lost sight of after the operation. No sooner is the patient sufficiently recovered to leave the hospital or his bed than his case seems to be thought unworthy of further notice. No fewer than forty-nine of the ninety-nine patients who were subjected to operation were thus lost sight of. In only thirteen instances is there a note to say that the patient was well some time after the operation, and in most of these the period which had elapsed since the operation was too short to allow of the cases being regarded as cured. The periods of sound health were as follow:—In the cases of carcinoma—some months, seven months, fourteen months, forty-two months, and 108 months; in the cases of sarcoma—five months, six months, sixteen months, twenty months, twenty-four months, thirty months, two of thirty-six months. There are thus only two cases of carcinoma and two of sarcoma which can be claimed as cured on the three-years' limit which has been used in the consideration of the results of operative treatment for malignant disease. I have little doubt that the cases in which the patient was well twenty-four and thirty months after the operation would prove, one or both of them, quite successful; for it is a noticeable feature of the cases in which there was recurrence or secondary affection of the glands or internal organs that the re-appearance of the disease was observed within a short, usually a very short, period after the removal of the testis. This was so even in those instances in which the fatal issue was delayed for two or more years after the castration. Although the patients lived, they lived in spite of the steady progress of large abdominal growths. The number of instances of complete cure is far too small to allow of any observation of the effect of operation on the different varieties of sarcoma, but it is worthy of notice that several of the best cases were of round-celled tumours, which are generally regarded as the most malignant, not only of sarcomas, but of malignant growths.

Unhappily, as in the history of malignant disease in other parts of the body, there is more than sufficient evidence to prove that operation is, in too many instances, useless in attempting to arrest the course of the disease. There are no fewer than thirty-three cases in which, in spite of castration, the patients died, either of the disease or of some unknown cause (too probably malignant disease), within a few months after the operation. I am wrong to say that all these patients were dead at the time at which their cases were reported, for one of them was still alive, but suffering from recurrence which was beyond the reach of operation. In fourteen of the thirty-three cases there was recurrence of the disease *in sitû*, and it is of interest and importance to note that in the large majority of the recurrent cases there had been either distinct thickening of the cord or the tumour was adherent to the scrotum. Indeed, of the cases in which there is a definite note of the condition of these parts, there are only two in which there is a statement to the effect that they were apparently both normal. Affection of the scrotum and thickening of the cord are such conditions as would naturally be expected to favour the occurrence of local return of the disease, but there are many instances to prove that either of them may be present, especially enlargement of the cord, and yet there may be no return of the disease *in sitû*. In most of the other fatal cases, the glands in the abdomen became enlarged, and, with them, the liver, lungs, kidneys, and other organs were affected. In at least ten of the fatal cases death took place within six months after the operation; and in at least eight other cases, between six and twelve months after the operation; in nine instances the note does not tell how long the period was before the fatal issue, and one patient was still alive with recurrence. But there are several instances in which from two to three years passed before the disease proved fatal.

With regard to the estimated duration of the disease at the time of the operation, the greatest variation was observed. In some instances the testicle had only been known to be enlarged for about a month, and in other cases several years had elapsed, but the disease had for a long time advanced so slowly that the patient had not sought advice, or cared to accept it when it was in favour of removal of the testis. The slow progress of the disease and its minor malignancy are probably the reasons why some of the most successful cases were of operations for the removal of tumours of more than a year's growth. But there is no reason to assume that, because these cases were successful, this is an argument in favour of deferring the operation. In the case of cancer of the testis, as of cancer of other parts of the body, the greatest hope lies in the early performance of castration.

Two points arise on the question of the prognosis—first, the prospect of cure in children; second, the prognosis in cases in which both testes are affected, either simultaneously or after an interval. I have already pointed out the gravity of the disease in children, and that in no instance in which the patient was kept under observation is there a record of permanent cure. Unfortunately, I am not able to add anything to our knowledge on this matter. For, although I have collected seven more cases of malignant tumour of the testis in children, every one of them was lost sight of after recovery from the operation with one exception, and in that case the patient was kept under observation only five months. He is said to have been in good health at the end of that period, but the time is far too short to allow us even to hope that he was cured.

With one exception, all the cases of affection of both testes have been cases of round-celled or lympho-sarcoma, and I cannot find any account of permanent cure in any case which has been kept in sight, although there are several instances to show how much relief may follow the removal of both the testes, and that the period of relief may last for one or two years after the second operation. The exception to the rule of lympho-sarcoma can, indeed, scarcely be termed an exception, for the two testes were not separately affected, as they usually are, but by direct continuity of the disease. The carcinoma, which, by-the-by, does not appear to have been examined microscopically, seems to have recurred in the ulcerated scrotum, and thence to have reached the second testis. This was removed, and the patient was alive and well no less than nine years later. This case is, moreover, the only instance which we have of a successful issue of an operation for the removal of recurrent disease. In those cases in which recurrence takes place in the stump of the cord, the condition is rarely suitable for a second operation; indeed, with the appearance of the recurrent growth there is often clear evidence that the abdominal glands are affected. And the instances in which the recurrent disease is limited to the scrotum are so few that the case which has been just recorded is almost the only one of them of which I have a note.

Are patients who are not cured, relieved by operation? To this question a very decided answer in the affirmative may be given. Not for every case, perhaps, but certainly for the large majority of instances in which the operation has been performed before there is evidence of advanced disease. In nearly twenty of the cases which proved fatal (after the operation, but from causes unconnected with it) there was not any recurrence of the disease *in sitû*, and the very large majority of these patients died of the effects of an abdominal tumour, for the most part glandular. It cannot, of course, be maintained that death from this cause is free from pain or distress, but it is quite sure that the presence of a large and heavy tumour in the scrotum would have added much to the sufferings of the patients, and their distress would have been infinitely greater had the testis sloughed or ulcerated. Malignant tumours of the testis sometimes attain an enormous size, and become extremely irksome by their size and weight. The removal of such an encumbrance affords marvellous relief; and, as the relief is purchased at a very small risk to life, and with very little pain or inconvenience, there is, in addition to the prospect of a permanent cure, a great inducement to a man to undergo the operation. In those cases in which the cord appears not to be at all enlarged, and there is no adhesion of the tumour to the scrotum, a very fair promise may be given that the disease will not recur *in sitû*.

Conclusions.—Castration for malignant disease is an operation which may be performed with very small danger to life.

The operation, whether for sarcoma or carcinoma, cannot be said to be attended with large success, so far as complete cure of the patient is concerned, but there is a great lack of information on this subject.

There is, however, evidence to show that it *may* be attended with permanent success, and there is still further evidence to show that the operation may be an excellent palliative measure, even if it fails in its primary object—cure.

There is comparatively little fear of recurrence *in sitû* unless the cord is thickened or the scrotum adherent at the time of the castration.

There is no prospect of success for operations for recurrent disease unless the recurrence is seated in the scrotum.

Castration may be performed for malignant disease of both testes, if not with a reasonable prospect of permanent, yet certainly of temporary, relief.

Castration may be performed with the hope of temporary relief in cases of malignant disease in children.

CHAPTER XXVII.

VULVA.

A FEW cases of sarcoma of the vulva have been recorded, notably one by Volkmann (*Beiträge zur Chirurgie*), in which a pedunculated spindle-celled sarcoma grew from the vulva of a child, but the disease is so rare that we need not consider it in relation to treatment.

Carcinoma of the vulva, although not rare, is nevertheless not a common disease. Gönner's statistics, taken from the Basle gynæcological clinic in the course of several years, showed that only five cases had been observed among 900 cases of female disease which included 100 cases of malignant disease of the female organs of generation. The variety of carcinoma is almost always the squamous-celled or epithelial. Any part of the vulva may be the primary seat of the disease, but the large labium is the seat of predilection. Sometimes the sore or wart is situated between the large and small labia, and thence spreads to both. The form in which it first appears in many instances is that of a wart or a collection of warts or tubercles. These may be very irritable, and the patient is obliged to scratch them frequently, and this may increase the liability to cancerous metamorphosis of a condition not yet truly malignant. Ulceration occurs usually at an early period, and the ulcer may be either deep and crater-like, or may be flat and tubercular or warty. The disease may indeed be raised above the surface of the surrounding part of the vulva, and the ulceration may be quite superficial. The base is, however, indurated, and the disease extends from one part of the vulva to another until a large area may be involved. Singularly, it does not appear to tend to spread towards the interior of the vagina, although I have seen cases in which it had done so. On the other hand, it may extend on to the skin of the thigh or groin. The inguinal lymphatic glands are affected as the growth advances, and the glandular affection may be present on both sides. As of the primary disease, so of the glands, ulceration may take place; and, as the effect of the ulceration, the patient may succumb. But there are instances on record which show that generalization of the cancer may take place in many tissues and organs.

Cancer of the vulva must be regarded as a decidedly malignant disease—far more so than malignant disease of the lower lip, for example, but probably not so malignant as cancer of the tongue. Unfortunately, the situation of the disease prevents women from seeking medical advice at the earliest periods; and also, in the case of younger women who suffer from it, may lead to a mistake in the diagnosis between epithelioma and syphilis.

Like the cancers of other parts of the body, cancer of the vulva is a disease of mature age. There is, however, at least one case on record of epithelioma of the vulva in a woman of twenty.

The total duration of the disease, if left to itself, is said to be about two years, but the commencement of the two years is dated by some authors from the time of the first appearance of disease about the vulva; by others, from the commencement of ulceration.

Methods of Operation.—The easily accessible position of vulvar cancer renders it possible to deal with it by several different methods. It may be destroyed by means of caustics, or may be removed with the galvano-cautery or knife. The first method is peculiarly adapted to those cases of carcinoma which are of small extent and are not too deeply seated; the second method, to carcinomas occurring in aged or very delicate persons whose blood must be spared; the third, to the large majority of cases of carcinoma of moderate extent, and to carcinomas of large extent occurring in women in an average of good health.

Caustics.—I may refer the reader to the chapter on the Breast for an account of one of the best caustic applications and for the method of employing it. No important modifications are required in dealing with a cancer of the vulva, except that it is necessary to take greater precautions to protect the parts immediately below the seat of the disease (as the woman lies in the recumbent posture) than when a tumour of the breast is dealt with. A modification of the lint wall round the caustic recommended by Bougard may be made in the form of a piece of soap plaster spread on thick wash-leather, in the centre of which a hole is cut of the exact size of the area to be destroyed. I have used this in the destruction of cancers of the breast, and have found it answer admirably for the protection of the surrounding integuments. The soft texture of the parts forming the vulva, and the presence of ulceration in almost all the epitheliomas of the part, render their destruction by no means difficult or tedious.

Galvano-cautery.—A good zinc and carbon battery, with Middeldorpf's instruments, suffices for this purpose; or the removal may be effected by means of Pacquelin's thermo-cautery. If the former is employed, the disease is included in a loop of platinum wire, which is slowly drawn tight and heated to a dull red heat. For the prevention of hæmorrhage, a red heat and very gradual division are essential. The galvano-cautery loop is of course not suitable in cases in which the disease is deeply seated. If the knife (galvano-cautery) is used, the tissues are cut through with it in the same manner as if a cold knife were used, the same care being taken to keep it at a dull red heat. Gönner, who recommends the use of the galvano-cautery, says that the two sides of the wound may be brought together after the operation, and that union by the first intention may take place in part of the wound in spite of the presence of a crust formed by the cautery. It is not easy to understand this.

Knife.—The situation and extent of the disease must determine the manner of the operation. If the Listerian dressing is not employed, the parts should nevertheless be thoroughly cleansed and the hairs removed before the operation, and for twenty-four hours preceding it a solution of carbolic acid or some other antiseptic should be kept applied over the disease and the surrounding area. When the cancer is situated in the larger labia, the removal may be made with the greatest freedom and without fear of wounding any important structures; and even when it is situated about the orifice of the vagina or urethra, these canals may be cut into without hesitation. I am not aware of any instance of stricture of the urethra following the operation, however deeply the removal has been carried. The bleeding vessels may be clamped or ligatured as they are cut through; but if the operation is quickly performed, and the loss of a small quantity of blood is not an important consideration, the whole of the disease may be rapidly removed, and the vessels tied when this has been completed. The wound may be dressed with carbolic or sanitas oil or lotion; but I believe there is no better application than iodoform frequently powdered over it. As a still further protection against sepsis, the orifice of the vagina should be filled with antiseptic gauze. If the glands are obviously enlarged, they are removed, but the prognosis is far graver in such cases so far as complete cure is concerned.

Again, the question is raised whether it is better to remove the glands through a separate incision, or to continue the incision for removal of the primary cancer up to the groin. On this point I think there ought not to be the least doubt. If actual nodules or chains of disease can be felt between the primary disease and the affected glands, it may be necessary to prolong the incision into the groin. But this should on no account be done unless there is a distinct indication that it is necessary. The two separate wounds are much less difficult to deal with than a single wound extending from the vulva up into the groin.

Results of Operations.—*Mortality due to Operation.*—It is very difficult, in regard to an operation which varies so much in magnitude as that for the removal of cancer of the vulva, to estimate in a useful manner the danger due to the operation. The disease is in one instance limited to the clitoris; in another, it extends to both labia on both sides, and thence reaches the perinæum on the one hand and the vagina on the other. In one case only a small portion of the vulva is removed, while in another case the glands are removed from both groins, in addition to an extensive operation on the vulva. But one thing is quite clear, not only from the forty cases I have collected from various authors, but from the many other cases I have looked through in hospital reports and reports of gynæcological operations, and also from cases I have operated on myself and have seen treated by my colleagues, namely, that operations for the removal of malignant disease of the vulva are singularly well borne. In the forty cases I have collected there is not one record of death from the operation; yet the operations were often very extensive, including not only the removal of a large part of the vulva, but in ten instances the dissection of the groin glands, either at the same time as the removal of the primary disease or by a second operation. In some of the cases the cancer of the vulva was removed, and at a later period recurrent disease of the groin glands. The cases have not been selected on account of the success which attended the removal of the disease. In several of the reports (notably, those of Muller, Gönner, Partsch, von Winiwarter, Fischer, and Küstner) they comprise all the cases of carcinoma of the vulva treated by operation in the course of several or many years. The total number of cases is of course very small. But I found that a very large number of cases collected with a view to show the mortality due to operation would not tell much more than this small number, namely, the small liability to death from such operations, even when they are extensive; while the hospital reports and statistics from which I could have gathered more material were only concerned with the death or recovery of the patient from the operation, and did not deal with the later history of the case. Probably a collection of two or three hundred cases would give a mortality of 2 or 3 per cent., for there is no immunity from death in these operations. I confess I have been very puzzled to account for the very low mortality which follows operations on the vulva. It is exceedingly difficult, and in some instances probably impossible, so to dress the wound that there shall be perfect asepsis. The wounds are often of large extent, and it is not possible to bring them together so as to procure healing by the first intention; urine and the discharges from the vagina infiltrate the dressings and reach the surface of the wound. Yet the wounds heal well and the patients recover. An analogy may, perhaps, be found in the recovery of men from operations for scrotal cancer. The chapter on this disease directs attention to the very low rate of mortality due to such operations, not only when the disease is of very small extent and limited to the scrotum, but when it extends to the deeper and the neighbouring structures, so as to necessitate a very severe removal. In both the vulva and the scrotum the tissues are very vascular and repair takes place quickly, and the parts can be kept comfortably at rest. But there is no satisfactory explanation of the absence of death from wound-poisoning, which might surely be rather anticipated here than be really of rare occurrence. In the large majority of instances the removal was effected with the knife, but the galvanic or actual cautery was employed in several cases with a perfectly good result.

Cures due to Operation.—Nine of the forty patients in my tables were lost sight of shortly after the operation, so that the total number we have to deal with in respect to the cure of the disease is only thirty-one. Records are at hand of the continued good health of nine of these thirty-one for a longer or shorter period after the removal of the disease; and one more patient is known to have been alive, but without any certain information whether she was well or ill, two years after the operation. Under some circumstances this patient might be regarded as having an excellent prospect of permanent relief, but, unfortunately, the groin glands were slightly enlarged at the time of the operation, and, although there are cases to prove that such slight enlargement may subside after the removal of the primary disease, in the absence of decided information this case must be regarded as very uncertain in its issue. The duration of the relief in the nine cases was one year, eighteen months (in two instances), two years, three years (in two instances), four years and a half, and "many years," and in one instance the statement is merely to the effect that the patient was radically cured. The words "radical geheilt" occur in reference to a patient treated by Rose and reported by Fischer, and, as Fischer well knows the importance to be attributed to the expression, may be taken to mean that at least three years had elapsed since the performance of the operation. Admitting this case, there are five of the thirty-one in which the patients are known to have been well and free from all disease at least three years after the last removal. If this proportion is correct for a larger series of cases, the percentage of cures would be rather over 16. I think this percentage is probably reasonably correct, although I should not attempt to make an authoritative statement to that effect.

I have looked through the reports with care in order to see what class of cases these chiefly belonged to. First, with regard to the situation of the disease in the nine cases—in the majority of them the cancer was seated in the larger labium; but then it is found that a very large proportion of the total of forty cases was made up of cancer of the larger labium, and that, with the exception of the posterior commissure, every part of the vulva is represented among these nine successful cases. No weight, therefore, can be attached to the influence of the primary seat of the disease, so far as this table goes. One circumstance is noticeable, namely, that in two cases, in which the patients were alive and well after eighteen months and four years and a half respectively, the disease was of such considerable extent that it could not be attributed to any one part of the vulva. Another fact is still more striking, and it is this: there is not one of the cases in which the glands were cancerous in which a complete recovery is registered. Ten such cases are recorded, in seven of which the glands were affected and were removed at the time of removal of the primary disease, and in three of which they became affected after the removal of the primary disease and were dissected out by a second operation. Two of the ten patients were lost sight of shortly after the operation, but the remaining eight died. In six of these fatal cases the death was distinctly said to have been due to recurrence of the disease *in situ*, while in the other two the death is merely stated to have been produced by general carcinosis, and the fact of local recurrence is not stated. I should not, of course, venture on the evidence afforded by these few instances to say that the prognosis is absolutely fatal in every instance in which there is affection of the lymphatic glands; but it is very clear that affection of the glands, whether it be present simultaneously with, or follow the removal of, the primary disease, renders the prognosis many times worse than it is in those cases in which the glands are sound.

There is still one more case which may be regarded with satisfaction, although it cannot be claimed as a cure by operation. It is that of a woman whose clitoris was removed with the galvano-cautery, and who died two years and a half later of inflammation of the lungs, but without any sign either of local recurrence or of general disease. Another half-year, and this patient might have been placed in the returns of those cured.

There remain twenty of the total of forty patients to be accounted for, and unhappily there is a record of the death, or the shortly expected death, of every one of them. In nine cases there was recurrence of the disease either in the vulva or in the groin (whence the glands had been removed); and in eleven death occurred from the disease, but without any evidence, or at least any statement, of local recurrence. In the majority of these eleven cases it is quite certain that there was not any recurrence of the disease in the vulva, for the absence of recurrence is distinctly stated, but the groin glands became affected or the disease attacked the internal organs. There is therefore ample evidence to prove that cancer of the vulva is a very fatal disease in spite of operative surgery. No doubt the results would be far better if the patients were submitted to operation at a much earlier period; but, unfortunately, there are circumstances which make it difficult to obtain early operations. Several of the cases in my list show that the importance of the disease was not suspected by the patients even after it had existed for a considerable period, and that consequently medical advice had not been sought at a time when it would have been most valuable. In addition to this, the natural reserve of women in relation to the diseases of these parts makes it more difficult than it otherwise would be to induce them to seek assistance when assistance would be most serviceable.

I am sorry to say there is not one instance in which a complete cure can be claimed after an operation for local recurrence of the disease, although there is one case in which the result is so far satisfactory that the patient was alive and quite well two years after recurrent disease had been twice removed. An interesting question in relation to the recurrence of cancer of the vulva is that of the relation of the primary seat of the disease to the recurrence. Local recurrence was noted after disease of the clitoris and larger labium, of the larger labium alone, of the lesser labium, of the junction of both labia, of "widespread" disease, and of the posterior commissure. But the posterior commissure furnishes alone two cases, while each of the other parts named furnishes only one instance of local recurrence; and this difference is the more marked because there are only four instances (in the list of forty) of disease of the posterior commissure. The reason probably is the near approach of the disease to the anus on the one hand, which makes surgeons unwilling to remove it as widely as they should do, and the fact that it may extend from the commissure far up into the interior of the vagina.

Are patients who are not cured, relieved by operation? This question may be answered certainly in the affirmative for many cases. But, before proceeding to show that this is so, it is necessary to mention one point which has not yet been adverted to. When the penis is removed on account of malignant disease, there is always the important consideration how far the act of micturition may be affected by contraction of the meatus urinarius. In the majority of cases of removal of cancer of the vulva, the disease is removed without any interference with the meatus urinarius, but there are cases in which the orifice is involved and it is necessary to remove it. I cannot find any evidence to show that these patients suffer in the least degree from inconvenience in micturition. Nor is the orifice of the vagina, unless in very rare instances, seriously contracted by the removal of cancer of even very large extent. I think, therefore, it may be said without fear that the patient, whether she is cured by the operation or not, is not at all likely to be left by it in an uncomfortable condition.

A study of the cases of operation which were followed at a later period by death shows that there was no local recurrence in the vulva in at least half of them. Indeed, I think it would be nearer the truth to say that two-thirds of the patients did not suffer from recurrence of the disease in the vulva. They died from affection of the groin glands, of the internal organs, and from recurrence in the groin. They were therefore spared the pain and distress which are frequently associated with the primary disease. An instance of this occurred three years ago in a hospital patient, which may serve as an example of the advantage which may in many cases be gained by operation, even when the operation is not successful in preventing the outbreak of a cancer in another part of the body. The patient was a woman of nearly seventy years of age, who had suffered for about eight months from cancer of the vulva. The disease, at the time she came under my care for operation, was very extensive, so that the removal of one side of the vulva together with an area of disease on the other side was needed. She recovered well from the operation, but the groin glands became enlarged in the course of a few months, and finally broke down and ulcerated, when her decline was very rapid. Her death took place a twelvemonth after the operation, and during that period she was in great comfort until the final decline. Before the removal of the primary disease she had suffered the greatest distress, for the cancer was so placed that the urine passed over it and burned the surface of the ulcer, and she could not sit with any comfort. She had on this account, and because even walking was painful to her, been obliged to keep her room for several weeks before I saw her. This is merely one of a class of cases frequently observed.

Conclusions.—Cancer of the vulva, even when the disease is extensive, may be removed with very little danger to life.

If the disease is freely removed before there is affection of the lymphatic glands, there is a fair prospect of permanent benefit.

If the glands are involved at the time of the operation, or become involved at a later period, there is little hope that removal of them will be attended with permanent success.

Yet even under these circumstances operation may be performed if there is a reasonable prospect of completely removing the primary disease so that there shall be no recurrence in the vulva.

Operations may be practised for recurrent disease if it is so situated that it can be freely removed, but the prognosis is in such cases much worse than for the removal of primary disease.

CHAPTER XXVIII.

VAGINA.

Both sarcoma and carcinoma may attack the vagina; neither of the two is common, but sarcoma is much rarer, so far as our present information leads us to believe, than carcinoma.

From the accounts which have been published, Breisky (*Deutsche Chirurgie*, Lief. lx. 163; 1886) has drawn up as clear an account of vaginal sarcoma as can be found. He finds that the tumour may take the form of a prominent, smooth, polypoid growth, resembling a myoma or fibroma; or of a flattened mass infiltrating the vaginal wall beneath the mucous membrane. It may attain a considerable size in the first class of cases, and may ulcerate early in the second class, so that it may well be mistaken for an epithelioma. Instead of a single growth, there may be multiple tumours, and this is especially the case in children. I have myself seen such a case in which polypoid and dendritic tumours not only covered the interior of the vagina, but occupied the bladder and probably the uterus as well. The disease may attack both adults and children, quite a large proportion of the recorded cases having been noticed in children under the age of six. The first symptoms may be the appearance of a tumour at the vaginal orifice or the discharge of blood and offensive pus, and in some instances there are radiating pains and general discomfort. Removal of the tumour, whether single or multiple, is usually followed by recurrence, and this may take place several or many times in succession with great rapidity, even when the base of the growth has apparently been carefully removed. Death may be caused by these repeated new growths, and by the exhaustion due to their presence and removal; or secondary tumours may be developed in the lymphatic glands, not only of the pelvis, but of the groin, the axilla, and other parts of the body. Of the precise course of the disease in its relation to the parts immediately surrounding the vagina there is not much information at present before us, but the disease is certainly infiltrating. Some of the cases, especially the cases of sarcoma mingled with fibrous tissue (fibro-sarcoma), may cover a long period of time, but there are also instances which show that the course of the disease may be very rapid. The formation of secondary growths in distant organs and tissues appears to be a rare circumstance. The structure of the tumour may be either round- or spindle-celled. The growth may arise either in the anterior or posterior wall of the vagina, and at any point between the orifice and the uterus.

Carcinoma of the vagina is usually of the squamous-celled variety. It is a disease of adult life, but occurs in many instances at rather an earlier age than carcinoma generally does. Thus, in twenty-two cases analysed by Küstner, no fewer than nine of the women were between thirty and forty years of age, and two were between fifteen and twenty. It appears to attack the posterior much more frequently than the anterior wall, and may present either the form of a papillary growth or of a flat infiltrating tumour which speedily ulcerates. The disease may cover a large area of the interior of the vagina, and may extend to the vaginal portion of the uterus, but does not often spread to the vulva. Extending in depth, it may affect the bladder and urethra or the rectum, and fistulous passages may be formed between these cavities and the vagina. It may make its way, too, into the peritoneal cavity. Secondary affection of the pelvic glands may occur. The number of cases of the disease recorded is at present too small to allow any extensive generalization to be made of its course and duration, but it appears to prove fatal at a comparatively early period. The diagnosis in the earliest stages depends chiefly on the discharge of offensive fluid and blood from the orifice of the vagina.

Methods of Operation.—The method of removing a malignant tumour depends more on the outward form of the growth than on the precise nature of the disease. The multiple growths, which have been noticed chiefly in children, have not, so far as I am aware, been successfully dealt with. In the single instance which came under my own observation, and which has been already mentioned, several of the tumours were ligatured and came away, but without any decided effect on the course of the disease.

Prominent polypoid masses may be cut off and the supplying artery may be ligatured, or the pedicle may be first ligatured and the tumour then removed. But whether the pedicle be large or small, if the tumour is a sarcoma this treatment will certainly be followed by recurrence of the disease. It is essential that the seat of attachment should be removed, and the removal should be very free. The patient must be placed in the lithotomy position, the legs held by assistants or fixed by means of Clover's crutch, as in the operation for ruptured perinæum. A vaginal duck-billed speculum is introduced, with the blade on the opposite wall to the tumour. The tumour is seized with a pair of vulsellum forceps and drawn down so that, if possible, its base shall be external to the vulva. The seat of attachment is then freely cut out with knife or scissors as deeply as appears necessary. The cuts should be short, so that the bleeding vessels may be taken up and ligatured as they are divided. If the base of attachment is small, the edges of the wound may be brought together with silk or horsehair ligatures in such a manner as to leave a longitudinal scar; but if the incision has been carried deep, it is desirable to insert at the lower part a small tube or piece of gutta-percha tissue, otherwise pus may collect and decompose, and so give rise to septic poisoning.

The removal of infiltrating growths, when they cover only a small area and are low down in the vagina, is not more formidable than the operation which has been just described; for the parts affected may be actually brought down external to the vulva. The operation is performed in the same manner as when the growth is prominent. But it is far more difficult, and may be dangerous, when the disease occupies a large area of the vaginal wall, when it is situated high up in the vagina, perhaps reaching to and involving the portio vaginalis of the uterus. The operation may be made even more difficult by adhesions of the uterus and vagina due to past perimetritis, thus preventing any attempt to draw the parts down beyond the vulva. Although a set operation is not applicable to all these cases, the procedure described and practised by Schroeder in several of them will serve for many.

Liberally translated from his paper in the *Zeitschrift für Geburtshülfe und Gynäkologie* (Bd. iii. N. F. p. 423, 1878), it is as follows:—"In my three cases the carcinoma was seated on the posterior wall of the vagina, so far up that it reached to the reflexion of the vagina, and the posterior lip was not quite free from the disease, although in the first two cases there was still a narrow strip of sound mucous membrane in the posterior reflexion of the vagina.

"In the third case the anterior lip was also suspect, and on this account I excised it first, separately.

"Then I cut from the cervical canal across the posterior lip, until I had quite divided it, and next incised the mucous membrane superficially round the whole of the tumour. In the upper part I deepened this incision, until the entire thickness of the mucous membrane was divided, and separated the carcinoma from its bed from above downwards. In this proceeding the peritoneum of Douglas's pouch was torn, and was sewn with a silk ligature. Little by little the carcinoma was raised up from its bed, so that the wall of the rectum was exposed, with its layer of smooth muscular fibres.

"In the two first operations I brought together the cut edges of the wound in the vaginal mucous membrane transversely, but owing to this a space was formed between the vaginal mucous membrane and rectum, bounded above by the stump of the uterus and peritoneum, in which the secretions of the wound collected and decomposed.

"In the last case, therefore, I included the wall of the rectum in the sutures, but did not pass them through the lumen of the bowel, and inserted a drainage tube in the posterior reflexion of the vagina."

This proceeding of Schroeder has been practically followed in most of the cases which have been treated by removal of late years. Sometimes the disease has been removed from above downwards, sometimes from below upwards; and in one instance Grammatikati brought together the sides of the wound from below upwards during the earlier steps of the operation, before the separation of the carcinoma was completed.

Instead of removing the disease by cutting operations, such as those which have been described, it has in some instances been scraped away as thoroughly as possible with a Volkmann's spoon; and, combined with this treatment or separately, caustic has been employed. Of late years, however, the feeling of the majority of gynæcologists has been in favour of operations with the knife or scissors. If caustic is preferred, the preparation described in the chapter on Malignant Disease of the Breast may be employed.

Again, on account of the advanced age of the patient or of her weakness, the galvano-cautery may be employed for the whole or part of the operation, with a view to reducing the hæmorrhage to the least possible amount.

Results of Operations.—The number of cases which I have been able to collect, to illustrate the results of operations for the removal of malignant disease of the vagina, is, as might be expected, very small; in fact, I have only notes of twenty-four—eleven cases of carcinoma, thirteen of sarcoma. I confess I was astonished at the relative proportions, for carcinoma is much more frequent than sarcoma, and I fully expected to be able to collect a much larger number of cases of the former disease. And so I could have done, had it been merely a question of the ordinary course of the disease, of the age of patients attacked by it, or any other general questions connected with it. But on the question of operation there is very little information, either because the cases have not been deemed sufficiently important to record, or because the affection is comparatively rarely treated by removal. On the other hand, sarcoma of the vagina is a rare disease, and nearly every case which is recognized is reported. Fortunately, although the total number of cases of the two diseases is small, the patients were kept under observation for some time after the operation in twenty out of the twenty-four. The records are therefore more than usually complete.

Deaths due to the Operation.—Three of the patients died of causes connected with the operation, and in all three the disease was sarcoma. In one of the three the death may be regarded almost as accidental, certainly not in any way peculiar to this operation, for the patient is said to have died of pulmonary embolism; but in the two other patients it was due to prolonged suppuration and secondary hæmorrhage. In the last case there had been hæmorrhages before the removal of the growth, and the patient was, as is too often the case, greatly debilitated before an attempt was made to treat her surgically. On the other hand, it is not certain that two more deaths ought not to be attributed more or less directly to the operation. A woman died eleven weeks after the removal of the upper part of the vagina and the uterus, which had become involved in the growth, and the cause of her death was said to be jaundice and double pneumonia, with rigors. She was said to have recovered from the operation at the end of the fifth or sixth week, but whether her recovery was complete may be doubted, for the account of the manner of her death is very suggestive of blood-poisoning. In the other case, artificial abortion was induced, and the growth was scraped away from the interior of the vagina. The patient died of sepsis, and death is ascribed to the abortion, not to the removal of the carcinoma.

Whatever may be said of these two cases, I think it must be allowed that the general mortality of the operations is large, especially when it is borne in mind that the removal of the tumour is, in the large majority of cases, limited to a mere excision. The disease is, however, not uncommonly of large superficial extent, and the patients are in a miserable state of health when they come under the care of the operating surgeon. But, however this may be, I cannot but believe that a second series of similar cases would yield a less mortality. In the cases which have been submitted to operation it has been rarely necessary to open the peritoneal cavity, or to interfere seriously with neighbouring organs. The only difficulties which have to be met are, for the very large majority of cases, the exhaustion of the patient and the difficulty of maintaining thorough drainage and an aseptic condition of the wound; and these requirements are certainly not impossible to comply with.

Except in the case of a patient suffering from the hæmorrhagic diathesis or exceedingly reduced in strength, secondary hæmorrhage need scarcely be apprehended as a cause of death.

Cures due to Operation.—The total results of the twenty-four cases were as follows:—Three died of the operation; twelve were dead or dying of recurrence of the disease; two died of other causes (their cases are mentioned in the preceding paragraphs); four were lost sight of soon after the operation; and three patients were alive and well at periods respectively of nine months, seventeen months, and four years after operation.

The first of these three cases, to which little importance can be attached, was that of a woman thirty-nine years old, who had a small tumour of about three months' duration on the anterior wall of the vagina. It was irregular, lumpy, easily bleeding, and movable on the subjacent tissues. It was cut out by Dr. Menzel, and proved to be a round-celled sarcoma. Nine months later the patient was well and seven months pregnant.

The second patient was also under the care of Dr. Menzel, who removed from the posterior wall of the vagina a growth about the size of a thaler, where it lay a little to the left of the middle line, with its upper margin reaching as far up as the portio vaginalis of the uterus. It had existed for about two months, and had already to some extent infiltrated the deeper parts, so that it reached almost to the mucous membrane of the rectum. The removal was freely made, but without interfering with the rectal wall, and the patient, who was fifty-five years old, made a good recovery, and was well and at her work nearly a year and a half later. The growth was examined microscopically, and proved to be a medullary carcinoma.

The third case is recorded by Spiegelberg. The patient was an adult, who for six months had been aware of a tumour in the lower part of the front wall of the vagina. It was about the size of a walnut, circumscribed, and easy to reach. It was freely removed, and on examination by Waldeyer, proved to be a spindle-celled sarcoma. The patient recovered, and was quite well at the end of four years.

The only one of these three cases which can be claimed to have been cured by the operation is the third, for the time which had elapsed since the operation in the other two was not sufficiently long. If, however, regard is had to the rapidity of recurrence in the cases in which recurrence was noted, the patient who was well at the end of seventeen months may be admitted to be in a hopeful position; for there is not one instance out of the twelve in which the return of the disease did not take place within six months of the operation, whether the tumour was sarcoma (seven cases) or carcinoma (five cases). In nearly all of them the recurrence was within a few weeks, and most of them terminated fatally before six months had elapsed. Indeed, the only exception to this rule was the case of a woman, in whom the disease returned very speedily, but whose strength enabled her to withstand its ravages for eleven months.

In all three of these more successful cases the disease was of small extent, circumscribed, not deeply seated, not involving any important organ, or necessitating the opening of the peritoneal cavity. In not one of them was a second operation performed.

With regard to repeated operations for recurrent disease, such operations were performed in several instances, but they were not followed by success.

Are patients who are not cured, relieved by operation? In the majority of the patients who have recovered from operation, recurrence of the disease has been so rapid that only a very short period of relief has been procured. Yet even in these cases there has almost always been a short period of comfort, generally purchased by an operation which is not followed by great pain or discomfort; and in two of the three patients who were reported to be still alive and well, and who cannot yet be regarded as beyond the reach of possible, or even in one case probable, recurrence, the relief has been thorough. It may be taken as a general rule that, provided the disease is within the reach of removal, and can be removed without interfering with any important structure, and particularly with the urethra or rectum, the relief procured by an operation will be complete as long as it lasts. Recurrence will of course be associated with as much discomfort as was the original disease. Even in those cases in which there is small prospect of completely removing the disease, it may sometimes be scraped away with a Volkmann's spoon or some similar instrument, and the surface of the wound cauterized, or treated with a strong antiseptic solution or powder, with great advantage. The removal, if only for a few days or weeks, of an offensive mass, does in itself more than compensate for the distress of such an operation.

Conclusions.—That the prospect of permanent cure by operation in the case of either sarcoma or carcinoma of the vagina is very small.

That the operations for the removal of the disease are not difficult, and are probably not so dangerous as the cases which have been described might lead us to believe.

That the disease, if of small extent and not deeply set, should be removed as early as possible. Such cases offer the best prospect of permanent relief from operation.

Palliative operations may be performed with advantage in some of the cases which are not within reasonable reach of a radical operation.

Infiltrating primary disease and recurrent disease are the least hopeful of all cases for operation.

With regard to the relative value of the various methods which have been employed for the removal of the disease little can be said, and the decision in any individual case must depend on the conditions of the disease.

It may be remarked, before concluding, that if malignant disease of the vagina were submitted to operation at a much earlier period of its existence than has usually been the case, the results would almost certainly be far better than they have appeared from the foregoing facts. There are no anatomical conditions in the vagina, especially in connection with its lower part, which need favour such extremely rapid growth and great tendency to recurrence after removal, as have been exhibited. It is true that the period during which the disease had existed in many of the cases was said not to have been more than two, three, or four months. But it is probable that it was far longer than this in some, if not in many, of the patients. The earliest signs of malignant disease are often merely a discharge from the vagina, associated with perhaps little pain and no discomfort, and this symptom is of such common occurrence, and is due to so many different causes, many of them of trivial importance, that the patients are not led to seek advice at a sufficiently early period; and if they had sought advice, many of them would only have received prescriptions, but would not have been subjected to an examination of the vagina. It is difficult to alter this condition of things, and at present there seems little hope that it will be mended.

CHAPTER XXIX.

UTERUS.

The surgical treatment of cancer of the uterus naturally occupies a large measure of our attention, on account of the frequency with which the disease occurs, its distressing nature, and the advances which have of late years been made in abdominal and uterine surgery. The material from which the subject can be studied is very rich; and I may mention here (to save repeated reference) that I have made use of the works of the following authors: Gusserow, Ruge and Veit, Pawlick, Wells, Schroeder, Corradi, Sara Post, and others. (Gusserow, *Deutsche Chirurgie*, lxvii.; Ruge and Veit, *Zeitschrift f. Geburtshülfe u. Gynäkol.* vi. and vii. 1881, 1882; Pawlick, *Wiener Klinik;* Wells, *Med.-Chir. Trans.* lxv.; Schroeder, *British Medical Journal*, ii. 1883; Corradi, *Trans. Intern. Med. Cong.* 1881, iv.; Sara Post, *Internat. Journ. Med. Sci.* 1886, p. 113.)

The uterus is liable to both carcinoma and sarcoma, but the enormous majority of cases are cases of carcinoma.

In spite of the difference of opinion which has been expressed during the past five years with regard to the varieties of *carcinoma* to which the uterus is subject, I think we may accept the conclusion as probable, that almost every variety may be found—epithelioma, glandular carcinoma, and columnar carcinoma. The two latter appear to be more common than the first, according to the latest researches; but for practical purposes the seat of origin of the disease appears to be of more importance than the variety of the carcinoma. For the convenience of classification, as well as for the question of treatment, the cancers of three parts of the organ are considered separately: those of the vaginal portion (included by a line drawn from the external os upwards and outwards in all directions to the attachment of the vagina), those of the cervix, and those of the body.

Cancer of the vaginal portion is usually superficial, often (but by no means invariably) papillary, of one or of both lips of the os. It tends to spread, not in depth or upwards into the cervix, but to the wall of the vagina, and from the vagina to the surrounding parts. The lymphatic glands may be affected, and secondary deposits may occur in other organs.

Cancer of the cervix may occur as a nodule in the substance of the cervical wall, or as an ulcer which eats deeply into the wall. It involves at an early period the wall of the uterus itself, and extends into the cellular tissue of the pelvis. It may also spread in the contrary direction, downwards towards the vagina.

Cancer of the body of the uterus, far more rare than either of the other two, and especially very much more rare than that of the vaginal portion, may form a papillary growth of a great part or the whole of the interior of the cavity, or may occur as a polypoid mass with an indurated base. It has comparatively little tendency to spread into the cervix, but extends peripherally towards the peritoneum, and at a later period produces secondary nodules in the cervix and vagina. The retro-peritoneal and lumbar glands are attacked, and dissemination may take place in many organs.

The disease, of whatever portion of the uterus, is a disease of adult age, and becomes much more frequent after the fortieth year. Nevertheless, a great many cases occur in women between thirty and forty years of age. It is not only a very fatal disease, producing death, in the large majority of instances, within a year or eighteen months after the first symptoms are noticed, but it is a terrible disease, on account of the pain, profuse and offensive discharge, and the frequent hæmorrhages with which it is too often associated. Death is due partly to these causes and to peritonitis and pyæmia, partly to the early and extensive occurrence of dissemination. The implication of neighbouring organs, such as the rectum and bladder, renders the condition of many of the patients pitiable in the extreme.

Sarcoma is much more common of the body than of the cervix or portio vaginalis of the uterus. It may occur in the form of polypoid masses or distinct tumours in the wall of the organ, or as a diffuse affection of the uterine wall. The distinct tumour is usually largely composed of fibrous tissue, and is what is commonly called a fibro-sarcoma; the diffused form is usually a round-celled growth. In rare instances polypoid sarcomatous tumours grow from the portio vaginalis. The fibro-sarcomas recur after removal again and again, weaken the patients by repeated hæmorrhages, produce peritonitis and pyæmia, and are frequently associated with secondary affection of the lymphatic glands, the lungs, liver, vertebræ, and other parts of the body. The diffuse sarcomas (round-celled) extend through the whole thickness of the wall of the uterus, until they reach and tend to involve the surrounding structures, the rectum, the vagina, and the bladder. Secondary affection of other parts of the body is not of such frequent occurrence as in connection with the polypoid fibro-sarcomas.

Both forms of sarcoma are far more common in women over than under forty years of age. Both tend certainly to produce death, but their course appears to be slower than that of carcinoma, so that the average duration of life is roughly set down at three years, instead of a year to a year and a half. Some of the patients are said to have lived as long as ten or more years, and it appears certain that the fatal event may be deferred by the removal, from time to time, of the polypoid growths in the case of the fibro-sarcomas, although they grow again. It is possible that the long duration of life in some of these cases may be explained on the supposition that the patient suffered for several years from uterine fibroids of the ordinary innocent type, but that these innocent tumours, after a certain period, became transformed into sarcomatous tumours. Judging, however, from analogy with the sarcomas of other parts of the body, it is by no means impossible that the disease may have been sarcoma from its commencement.

Some of the chief points of interest in connection with both sarcoma and carcinoma of the uterus lie in the study of their course as it is influenced by their seat of origin, and in the effect of operation on the disease respectively of the vaginal portion, the cervix, and the body of the uterus. The material for the discussion of these points is not yet complete, but it is nevertheless possible to consider them with advantage.

Methods of Operation.—The disease may be destroyed by means of caustics or electrolysis, or it may be removed with the écraseur, the galvano-cautery, the scissors, or the knife. The method which is adopted will naturally depend in large measure on the seat and extent of the disease. It is obvious that caustics and the galvano-cautery can only be employed with success in the treatment of cancer situated at or near the vaginal portion of the uterus, although attempts have been made from time to time to produce the cure of cancers of the interior of the uterus by the same means.

Caustics.—Of late years, one of the most popular local applications for the purpose of destroying cancer of the projecting portion of the uterus has been the spirituous solution of bromine (one drachm of bromine to three of spirits of wine). This has been employed by Routh, Wynn Williams, and others, and the application is said to have been followed by great success. It is used as follows: A speculum is introduced, the parts are thoroughly examined to discover the extent to which they are diseased, and are then cleansed carefully and dried with pledgets of cotton wool. A pledget of cotton wool is dipped in the solution of bromine, and applied to the part which is first to be attacked. The wall of the vagina is protected by thin pads of cotton wool saturated with a solution of carbonate of soda. A plug of wool is passed down the speculum on to the saturated pads, and over this is placed a piece of gutta-percha tissue. The bromine pad is left *in sitû* for three or four hours (Wynn Williams). The separation of the slough is not completed for a week or ten days. During this time the vagina is syringed out three or four times a day with a weak solution of tincture of iodine; and when the slough is separated, with a weak solution of bromine. The process is again and again repeated until every vestige of the disease has been destroyed.

Those who employ bromine and other caustics are, however, rarely satisfied with the mere application of them to the surface of the cancer. It is the practice of most gynæcologists to remove as far as possible the mass of disease before applying the caustic. This is done with the écraseur or knife; or, if the disease is papillary or superficial, with the sharp spoon or scoop. The actual cautery or thermo-cautery is also employed for the same purpose, sometimes after the bulk of the disease has been scraped or cut away, sometimes for its removal. The vagina is then plugged with cotton wool, which is left for one or two days, after which it is syringed out several times a day with a solution of iodine, or some other disinfectant and deodorizer. Iodoform may be used for this purpose.

Among the caustics which have been employed are chloride of zinc, nitric acid, acid nitrate of mercury, bichromate of potash and chromic acid. Each of these has its advocates, and various modifications are used in the application; but the method which has been described will serve as a general formula for most of them.

Supra-Vaginal Amputation, which consists of the removal of the vaginal portion and as much as is necessary of the neck (sometimes the entire neck and internal os) may be performed with the scissors, knife, écraseur, or galvano-cautery. I shall content myself with describing the operations with the knife and galvano-cautery (those with the scissors and écraseur being really no more than modifications of the operation with the knife and galvano-cautery), and shall take Schroeder's description of the knife operation and Pawlick's account of the removal by means of the cautery.

Schroeder says: "The supra-vaginal amputation is performed in the following manner. A Museux's volsella is attached to each lip, and the uterus drawn firmly downwards. In some cases it is then advisable to divide the cervix on both sides up to the vaginal fornix. The knife is now carried around the vaginal mucous membrane, dividing it all around in healthy tissue, and about one centimetre distance from the diseased parts. After this I push the anterior vaginal fornix, and with it the bladder and its peritoneal duplicature, upwards above the level of the internal os. Then, always dragging the uterus firmly downwards, I cut off the anterior lip transversely, taking care to make the incision in healthy tissue. The hæmorrhage is then arrested by suture, deep stitches being taken to unite the vaginal with the cervical mucous membrane, and these being pulled over the stump. The same proceeding is repeated with the posterior lip, during which manipulation the peritoneum of Douglas's pouch is generally torn. Finally, the bilateral incisions are closed, deep sutures uniting the fornix with the sides of the uterus."

The supra-vaginal amputation may, it is obvious, be performed with the scissors.

The operation with the *galvano-cautery* is described by Pawlick, whose experience was gained in the clinic of Dr. Braun-Fernwald (C. Braun). More than 130 cases are reported from this clinic, and the results will occupy us presently. Translating Pawlick's account liberally, it runs as follows: "The cervix was seized with Bozeman's forceps, which were so fixed that they entered the sound tissues, particularly at those points at which the new growth was thought to have attacked the vagina. Kuchenmeister's forceps also performed good service, particularly when one operated without the speculum, merely under the guidance of the fingers, for the lateral hook can be pressed in and closed firmly in the tissue, without any fear of the operator injuring himself. Large portions of the vagina were easily fixed by means of the strong Sims's hook, with which the posterior lip can be well drawn forward. The uterus was moderately drawn down, the bladder emptied and thrust up by means of a strong catheter. Then the loop of the cautery, under the continual control of the fingers, was placed over the fixing hook or forceps on the sound tissue, slowly tightened until it rested upon it everywhere. Wooden spatulas were placed in the vagina to protect it as far as possible from burning and scalding; one over the urethra, so that the hot steam might not scald it; and a second on the posterior wall of the vagina, to protect it from the heat of the hot conducting tubes. In addition, cold water was frequently injected into the vagina to cool the seething blood. The battery was put in connection with the platinum wire, and the circuit completed. The tightening of the hot loop was slowly made, particularly during the division of the vagina and the outer layers of the cervix, otherwise bleeding occurred. If the two conducting tubes rest on metal bodies, forceps, hooks, &c., and if they bend so as to touch at the seat of the bend, the circuit is interrupted and the wire works only as an écraseur. The surest means to convince oneself that the loop is working well is auscultation over the symphysis, where the gurgling of the fluid is plainly heard. The removed part is examined from time to time, on the one hand to see whether Douglas's pouch has been opened, on the other hand to see whether the incision is passing through sound tissues. In the first case one sees on the portion of the burnt surface answering to the posterior lip, when the part is bent slightly, a smooth pocket distinguished from the eschar by its cartilage-white colour. The wound in the peritoneum usually requires no other treatment than a rapid soldering with the hot wire. A glycerine tampon is placed in the vagina, and little or no reaction follows. If, however, the loop has been too quickly carried through the tissues, bleeding occurs, and a speculum must be introduced to stay it; after which the soldering can easily be performed, or the peritoneal wound is closed by means of stitches. The two margins are seized with Bozeman's forceps, drawn somewhat forwards, and united with silk sutures. If the peritoneum has not been opened, the vagina is daily syringed out with a weak solution of carbolic acid as soon as the discharge flows away; if it has been opened, the syringing is deferred for a few days longer. Accidental burning of the vagina does not require any special treatment.

Examination of the part removed also shows whether the operation has been made through the sound parts or not. In the latter case the burnt surface is not uniformly coloured brown with circular lines corresponding to the advance of the wire loop, but one finds at one or more points a crumbling, swollen, lighter-coloured tissue, which distinguishes the carcinoma from the sound parts. In this case Simon's speculum is introduced, the burnt surface is laid bare, the diseased parts seized with a pair of forceps, and excised as high as is necessary with a pair of curved scissors, or the galvano-cautery or Paquelin's cautery.

The separation of the eschar usually takes from ten to fourteen days; at this period any accidental wound in the peritoneum is firmly healed, and the granulating surface of the wound is frequently touched with a solution of nitrate of silver or bathed with crude pyroligneous acid.

The vagina contracts in time over the remains of the cervix and covers it completely, so that after a while only a stellate scar is apparent. The contraction of the scar produces almost regularly, after a certain time, dysmenorrhœa, which may amount to absolute retention. Assistance may be easily afforded in such a case. The scar is examined at the period of the menses; if there is still a pervious passage, a red point is visible, which indicates the vaginal end of the stenosed canal, through which the drops of blood ooze. A fine sound is passed for the purpose of discovering the direction of the canal, which is gradually dilated by the passage of thicker and thicker sounds. In women who can attend every month, this treatment perfectly suffices; but for those who are unable to do so, bilateral discission is practised, which protects them against dysmenorrhœa for a long time. If the canal is completely closed and hæmatometra is present, the direction of the uterus is ascertained by examination through the rectum, a curved trocar is thrust into the middle of the stellate scar, and thus a passage is made which may be further enlarged by discission. After the discission there is usually some bleeding, which does not call for treatment; more severe bleeding is checked by dropping in a styptic solution, and inserting a tampon of cotton wool, medicated with chloride of iron. The tampon ought not to be introduced into the split canal for fear of exciting parametritis. On the twentieth day accidental adhesions can be dissolved by means of a sound or Ellinger's dilator.

The amputation of the vaginal portion and neck with the écraseur does not differ materially from the removal with the galvano-cautery loop, except that the cutting is performed by force (applied by means of a screw) instead of by heat. A strong cord or twisted wire écraseur is the best for the purpose.

The dressing of the operation wounds made by the supra-vaginal operation varies according to the method of treating intra-vaginal wounds generally practised by the operator. In some instances the vagina is filled with pads or pledgets soaked in some antiseptic solution, and these are changed at regular and tolerably frequent intervals; in other instances the vagina is washed out several times a day with an antiseptic solution. Greater precautions are usually taken against septic poisoning when Douglas's pouch has been opened, but Pawlick says that, even in the absence of strict antiseptic methods, septic poisoning after the use of the galvano-cautery is not common.

Removal of the Uterus through the Vagina.—Here, again, I shall avail myself of the excellent description given by Schroeder (*British Medical Journal*, ii. 1883, p. 521), but shall mention certain modifications which have been employed by some of the most successful operators during the last three years. Schroeder speaks as follows:—"Should it be necessary to perform total extirpation of the uterus, this is executed in the following manner:—Two volsellæ are again applied to the lips; these pull the uterus as far down as possible. A circular incision is then made in healthy tissue around the cervix, and the vaginal mucous membrane pushed back and upwards, as in the previous operation. Next, Douglas's pouch is opened by a transverse incision, and the uterus is then turned over, so that its fundus appears in this opening. This is not always an easy manipulation. I generally first produce a retroflexion of the uterus, then catch the fundus with a volsella, and pull the body of the uterus through the incision in Douglas's pouch. After this has been done, it is easy to separate the peritoneum of the vesico-uterine pouch, leaving the uterus now only attached to the broad ligaments. These are ligatured either with a single ligature, or separately in different portions. Finally, the uterus is cut off close to its side, leaving a broad piece of tissue between the ligatures, in order to prevent the ligatures from slipping off—a most disagreeable event, which otherwise is likely to occur. After having performed this on one side, it is repeated on the other side in the same manner, this being generally much easier. The wound in the peritoneum is now closed. In stitching it, I generally attach the ligatured broad ligaments to the corners of the wound. They thus form two pedicles, turning their stumps outside, enabling me to stop any hæmorrhage that might occur later on. Between both stumps I leave a small opening for a T-shaped drainage tube, the end of which, protruding out of the introitus, is wrapped up in salicylated cotton. This cotton is removed as often as it is soaked, otherwise the patient is left quite to herself. The sutures are removed after a fortnight. . . . . Above all, it is necessary to take all possible advantage of the mobility of the uterus, drawing it far down towards the introitus. . . . . The principal danger of the operation consists in the ligatures slipping off the broad ligaments. . . . . The operation is very difficult when the vagina is narrow. Thus it is not easy to perform on nulliparæ, and is often impossible on very old women. Besides, it will scarcely be found possible to perform it when the uterus is very much enlarged: for instance, when it has reached the size of the pregnant uterus in the third month."

Three men have operated with signal success during the past three years—Fritsch, Martin, and Staude, and each of these men employs some modification of the foregoing method. Fritsch divides the lateral vaginal wall first, penetrating as deeply as possible, and ligating vessels as they are encountered. He next opens the anterior cul-de-sac, and unites the peritoneal border to the anterior vaginal wall by three or four sutures. He then anteverts the uterus, and ties the broad ligaments in small sections, dividing them as tied, six or seven ligatures being employed upon each side. He opens the posterior cul-de-sac last, finally uniting the peritoneum with the vagina as before. He leaves the peritoneal cavity fully open, and uses no drain, but dusts the wounded surfaces with iodoform, and packs the vagina with iodoformized gauze, which is left undisturbed from seven to ten days.

Martin operates *in sitû*, ligates the vaginal wall before incision, and covers the supra-vaginal wound. Lately he has used iodoformized gauze.

Staude makes a circular vaginal incision, retroverts the uterus, uses mass ligatures, and divides the anterior cul-de-sac after the other uterine attachments have been divided. He completely closes the peritoneum and unites the vagina around a drain. (Sara Post.)

Removal of the Uterus through the Abdomen.—I cannot do better here than quote the description of Sir Spencer Wells of the removal of a gravid uterus with epithelioma of the cervix, for the vaginal operation was out of the question and the abdominal operation was successful. The patient was about six months pregnant. Sir Spencer Wells says:—"The patient was arranged precisely as for ovariotomy under phenol spray, but an opening was made in the waterproof covering for the passage of an elastic catheter, which was kept in the bladder, and the vagina was then plugged with thymol cotton wetted with warm water containing about 1 per cent. of phenol.

"The abdominal wall was then divided in the middle line for an extent of about 8 inches—from 2 inches above to 6 inches below the umbilicus.

"The uterus was then turned out, and was about the size of a very large adult head. Four sutures were introduced to temporarily close the upper part of the opening in the abdominal wall over a large flat sponge, and thus prevent escape of intestines or cooling of the abdomen by the spray. The ovaries were seen nearer the level of the fundus than I expected to find them, and it was quite easy to secure the spermatic artery, first on the left and then on the right side, by transfixing the broad ligaments below each ovary and tying with strong silk. Then, using the catheter as a guide, I began to dissect the bladder from the anterior surface of the uterus. The uterine wall was very thin, like a tense cyst, and soon gave way accidentally, the bag of membranes protruding.

"I punctured the membranes, and several pints of liquor amnii escaped. Then I drew out the fœtus, secured and divided the funis, but did not interfere with the placenta. I then separated the attachments between uterus and vagina all round, securing by pressure-forceps all bleeding vessels as they were divided, and removed the uterus.

"Then the forceps were taken off one after another, all bleeding vessels tied with carbolized silk, the vaginal plugs removed, and the opening into the vagina and the edges of the divided broad ligaments were brought together by silk sutures. The pelvis was carefully cleansed by sponging, the opening in the abdominal wall closed by silk sutures, and phenolized cotton pads, strapping, and flannel bandage applied just as after ovariotomy."

The operation lasted about an hour and a quarter, including the time necessary to procure and recover from anæsthesia.

The patient made a good recovery, but Sir Spencer Wells adds to his account of the case several recommendations for similar operations—the use of a good lamp, perhaps an electric light, in case the daylight is not sufficient for the illumination of the interior of the abdomen; the use of an elastic ring pessary supported on a stem in the place of the tampon, from which he derived very little assistance; a shorter incision in the abdominal wall, combined with tapping of the uterus and drawing off the liquor amnii.

The practice of sewing up the opening between the vagina and the peritoneal cavity does not find favour in his eyes, since he regards the sutures as unnecessary, and possibly injurious by preventing the escape of fluids from the abdomen. If sutures are employed, two rows are usually inserted, one uniting the peritoneum, the other the vaginal mucous membrane.

Drainage, which is regularly practised by some operators, is considered unnecessary by Sir Spencer Wells if the treatment of the case is thoroughly antiseptic.

Combined Abdominal and Vaginal Operation.—Partly to obviate the difficulties and disadvantages of both the abdominal and the vaginal methods, and to meet the requirements of particular cases, Professor Corradi of Florence has devised the following operation:—"As it is necessary for the operation that there should be a capacious vagina, we must prepare it a few days before, and if it is impossible to dilate it by any means, then we must renounce this vaginal method. We may perform this dilatation by means of india-rubber balls distended with water, and just before the operation we can take advantage of the anæsthesia to increase the dilatation to the highest degree. For the sake of brevity, I omit the other preliminaries, and will begin by saying that the patient must be placed on a table with a pillow under her buttocks, and in Simon's position. A small incision is then made in the linea alba just sufficient to allow the hand to pass into the peritoneal cavity. This done, the dilator is extracted from the vagina in order to introduce my speculum, or a large-bladed retractor, so as to enable us to see perfectly the neck of the uterus. The operator introduces his left hand through the abdominal incision, and places the tips of the fore and middle fingers in the peritoneal fold, which lies between the uterus and bladder, and at the same time pulls down with the forefinger of the right hand the anterior cul-de-sac, being thus able with both hands to recognize the exact limit between the uterus and bladder. The operator passes a needle into the middle of this cul-de-sac, close to the uterus, with a strong double silken thread, leaving the ends out of the vagina and the loop out of the abdominal incision. With the left hand he turns the body of the uterus into Douglas's fold, so as to put it in a position of forced retroversion, and pulls it outwards. He next divides with a knife the vagina from the posterior part (now anterior) of the neck of the uterus, and, keeping always close to it, he cuts the corresponding fold of the peritoneum. This incision must be semicircular and transverse, and lies near the uterine insertions of both utero-sacral ligaments. By pressing gradually with the left hand on the body of the uterus, it is made to pass through this incision, and the operator seizes it with two strong-toothed forceps near the insertion of the two Fallopian tubes. This done, the abdominal end of the silken thread must be passed through the wound in Douglas's fold, and between the two forceps, so that it forms a loop which goes round the uterus in the median line. The thread is then drawn through, and the wire is made to take its place. In the looped end of this double thread must be fixed one end of a platinum wire, 1 millimètre in diameter. The two ends of this wire loop must be put into a wire-holder. The operator withdraws his left hand from the abdomen, and, having placed the loop of platinum well and straight, he renders it incandescent by means of a galvanic pile, and so divides the uterus in its median plane. It must be remembered that the uterus is very much retroverted and flexed, and that it is drawn downwards and outwards, so that the circulation of the blood in it is arrested. If, therefore, the universally known electro-thermic rules are followed, we may be almost certain to have no bleeding from this incision. But even if bleeding should occur, it would be very easy to arrest it if a provisional ligature were placed on each half of the uterus. This division of the uterus might even be effected by the écraseur or the scissors, for, as I have said, the surgeon might command any hæmorrhage with provisional ligatures; but, if a battery is at hand, I think it better to use the galvanic loop. The two halves of the uterus, thus divided and drawn by the two forceps to the left and right, separate one from another. Then the operator carries his left fore-finger into the anterior peritoneal fold, and with this sure guide he cuts from the neck of the uterus with blunt-pointed knife, or with scissors curved on the flat, the left half of the anterior cul-de-sac and of the corresponding peritoneal fold. The same is to be done on the right side of the anterior cul-de-sac, so that each half of the uterus remains attached only by its own ligaments. In this way it is quite easy to secure the bladder and ureters from injury. The division of the uterus is also very useful for securing the ligaments and the extirpation of the ovaries if it should be necessary. We may take one half of the uterus—suppose the left—and turn it on its own axis, so that the divided side is now turned outwards, and the side where the ligaments are attached, inwards. The operator may then seize and bring out, if necessary, each ovary after having it well strangulated; he can do very high ligatures of precaution on the Fallopian tube, on the round ligament, and on the utero-sacral ligament; and finally he seizes with a forceps the Fallopian tube and round ligament, and draws them up in order to unfold the broad ligament, which must be pierced by a needle carrying a strong silken loop, to be used for the two ligatures; the first so high as to surround the broad ligament and the tube, the second lower, to surround the utero-sacral ligament near its uterine attachment. It is hardly necessary to say that the two loops ought to be passed into each other, and that the ends of one of them should closely strangulate all the tissues. We must next tie the same ligatures on the other side, that is, on the ligaments of the right half of the uterus. Then, keeping always both halves of the uterus apart from one another and forcibly drawn outwards, the operator unites by means of the interrupted suture the edges of the transverse vaginal wound, including the peritoneum. Each half of the uterus is then removed separately, the tissues being divided close to the ligatures, and thus the ligaments and the ligatures which strangulate them are brought out at the angles of the wound in the vagina. After having carefully cleaned out the vagina, the operator sews up the abdominal wound, and so finishes the operation, which I submit for your judgment."

Results of Operations.—*Mortality.*—Of the mortality of operations performed with *caustics*, with or without preliminary scraping away of the disease, we have very little knowledge; but it is probably not by any means large. The chief causes of death from the larger operations for the removal of uterine cancer (peritonitis, sepsis) are only likely to be rarely produced by scraping and caustics, particularly as the caustics which are frequently employed are antiseptic, and there is very little difficulty in maintaining an aseptic condition during the separation of the destroyed tissues.

The supra-vaginal amputation gives good results, so far as the danger to life is concerned. Schroeder says that he has performed the operation sixty-four times with eight deaths, a mortality of a little more than 12 per cent. Pawlick reports that the operation has been performed by Braun-Fernwald 136 times, and that ten of the patients died in the hospital. But, when the record of the individual cases is examined, one of these deaths is found to be due to recurrence of the disease several months after the removal of the vaginal portion. There were, therefore, nine deaths in 136 cases, a mortality of less than 7 per cent. All these 136 operations were performed with the galvano-cautery, so that the mortality due to galvano-cautery operations appears at the first sight to be much smaller than that due to operations performed with cutting instruments. It must, however, be borne in mind that it is possible, if not probable, that some, if not many, of the latter operations were more extensive than those performed with the galvano-cautery. On the other hand, too great importance must not be attached to this possibility, for it is certain, from the account of many of the cases, that the galvano-cautery loop was passed very high up around the neck of the uterus, Douglas's pouch having been wounded in no fewer than thirty-nine of them, and a fistulous opening having been established in one case. The causes of death in Schroeder's cases are not stated. Of the nine deaths reported by Pawlick, six were due to peritonitis, two to hæmorrhage, and one to the formation of an abscess in the vicinity of the uterus. Adding together the total number of cases operated on by Schroeder and Braun-Fernwald, there are exactly 200, with seventeen deaths, a mortality of just 8.5 per cent.

Removal of the uterus through the vagina has now been practised many times, so that Sara Post has been able to collect and analyse no fewer than 341 cases. Death resulted from the operation in ninety-three of these; the mortality is therefore large, a little above 27 per cent. It appears, however, probable that this percentage may be considerably diminished by improved methods of operating, for Post draws attention to the "recent announcement of but an 8 per cent. mortality in twenty-four consecutive cases by Fritsch, of but a 9 per cent. mortality in fifty-five consecutive cases by Martin, and of sixteen cases by Staude without one death." These three men have therefore removed the uterus nearly 100 times through the vagina with only seven fatal results. It might be thought that these successful runs of cases were rather accidental than due to improved methods of operating and management of the patients after operation, but I think the general improvement which is noticed in all operations of a similar nature, and the difference in the earlier and later results obtained by Martin, contradict this impression. I do not know when the present series of fifty-five cases was commenced, for Post thinks they probably overlap the statistics which she publishes of Martin's earlier cases. But, prior to 1882, Martin had operated on thirty-one patients, with twenty-three recoveries and eight deaths. Between 1882 and 1884 he performed twenty-one operations, with only four deaths; and his last series consists of fifty-five cases, with a total mortality of five.

The causes of death were for the most part shock, septic peritonitis, and general blood-poisoning.

The *abdominal removal* of the cancerous uterus does not appear to have been performed so often as the vaginal method, if one may judge by the published cases. Gusserow has, however, put together a very respectable number of 148 cases. Of these, no fewer than 106 terminated fatally, a mortality of more than 71 per cent. The mortality is so vast that one cannot wonder that the operation has fallen into disuse, and that the vaginal operation is preferred to it. In spite of this huge mortality, and of the fact that his list of cases does not include—so far as it is possible to exclude them—the cases in which the operation was abandoned because it was found impossible to complete it, and the further fact that no small number of those who recovered suffered from wounds of the bladder, the ureter, and rectum, Gusserow still considers that the operation of laparotomy for cancer of the uterus would rank as one of the most brilliant in surgery if the patients who recovered from the operation were permanently relieved of the cancerous disease. Opinions may, perhaps, differ on that point, but probably few surgeons will be found to dissent from the opinion that such a mortality is not in the least justified by such results as can be claimed for the operations which have been hitherto performed.

The "combined" method of Corradi does not appear to have been practised in many instances, and I know of no statistics from which its mortality can be gathered.

Cures effected by Operation.—The statement which was made with regard to the death-rate from the use of *caustics* applies equally to the percentage of recoveries. There are not any reliable statistics from which the successful results of this method of treatment can be ascertained.

Supra-vaginal amputation must again be judged by the results recorded by Schroeder and Pawlick. Schroeder only speaks in general terms of the results of his operations. He says: "Unfortunately, in a great number of my patients I have seen recurrence, in some cases after two or three years. Other cases have withdrawn from my observation, and only very few have remained until to-day quite without recurrence." Pawlick furnishes us with as complete information on the subject as it was possible for him to obtain. Of the 136 patients on whom Braun-Fernwald operated, thirty-three were quite well at the end of periods varying from one to nineteen years after the operation. Analysed more closely, one was well at the end of nineteen years, two at twelve years, three at eight years, three at seven years, three at five years, two at four years, five at three years, seven at two years, and seven at the end of one year. If the last fourteen cases are struck out on account of the short duration (less than the three-years' limit), there still remain nineteen women cured by this operation of a most painful, loathsome, and certainly fatal disease. If these nineteen cures were all that could be claimed from the operations on 136 women, the result would be accepted as very good. But it is, in truth, much better than this. We already know that ten of the patients died in the hospital (nine of the operation, and one of recurrence of the disease); twenty-two were lost sight of and could not be traced, but two of them were known to have been well two years after the operation; sixteen patients were discharged unrelieved; thirty-one patients died outside the clinic, of whom sixteen almost certainly suffered from recurrence of the disease (which did not take place in one of them until three years had elapsed from the time of the operation); three were known to have died of tuberculosis; the cause of death in the remaining cases was unknown. Twenty-two suffered from recurrence, but their deaths were not recorded (in one of these cases there was an interval of six years between the operation and the reappearance of the disease, in another case nineteen months); two patients died in childbed without recurrence, one more than seven years, the other one year, after the operation. The actual results are therefore these:—Deducting the cases of which the further history was unknown, or where death occurred from unknown causes, there remain just 100 cases. In twenty-two of these the patients lived without recurrence for at least three years after the operation, and nineteen of the twenty-two were actually alive and well at the time of the publication of Pawlick's paper. Fourteen patients, in addition, were alive and well more than one year and less than three years after operation. At least 20 per cent. of complete recoveries can be claimed by Pawlick for the operations in Braun-Fernwald's clinic, a result which will compare favourably with the results of operations for cancer in almost any part of the body. It may be said that, in so far as the removal of the cervix sufficed for the removal of the disease, the disease in all these cases must have been limited in extent, and the cases therefore singularly favourable for operation. This is undoubtedly a fact, and must be regarded as another plea for the better selection of cases and for early operations. I shall refer to Pawlick's statistics again in considering the desirability of very extensive operations for the removal of cancer of the uterus.

Sufficient time has not yet elapsed to allow statistics of the results of *removal of the uterus through the vagina or through the abdomen.* Of the abdominal operation, Gusserow says that all the patients whose history has been followed up after the operation suffered from recurrence of the disease. How many of them have been traced he does not say, but of the large number of cases which he had collected, 148, only forty-two survived the operation, so there are only forty-two patients of whom reports could be made. It is scarcely probable that recurrence has taken place in all these patients, but the percentage of complete cures must be exceedingly small.

Three years have not yet elapsed since the recovery from the vaginal operation of many of the women thus treated, but there are records of sound health and freedom from recurrence in some instances for two years, two years and a half, and two years and eleven months after the operation. I do not know the evidence on which some of the statements which have been made rest—for example, the quotation of Gusserow from Hoffmeier that of 129 patients twenty-eight were well at the end of two years after operation. Post's paper is unfortunately very incomplete on this matter, although it is a paper of great value in many respects. The tables and remarks which refer to the various methods of treating the wound, the success of different operators and different methods, the more favourable results which have been obtained during the last two or three years, are worthy of careful consideration. But the fourth table is called a "Table of Recurrence," and yet appears to consist in great part at least of cases in which the patients were reported to be well a year or two years after operation. The first column is composed of twenty-nine cases in which the patients were "well at the end of about one year," and the second column is composed of eighteen patients who were "well at the end of about two years." There is no explanation of the relation which the two columns bear to each other, but I imagine that the first of them contains the second, with the addition of eleven cases in which the patients were known to have been alive at the end of one year, but their histories were not traced up to the end of the second year, or two years had not elapsed between the operation and the date of the report, or they had died between the first and second year. A comparison of this table with the large table of 341 cases did not assist me in the study of this part of the subject, for I was not able to discover as many cured cases there as table iv. contained. Mrs. Post draws such conclusions, however, from the cases she has collected as do not appear to be warranted. Taking the cases operated on previous to 1882 as about 137 in number, she finds that ninety-seven of the patients survived the operation. As eighteen of the women were reported to have been well and free from disease two years after the operation, she considers that the cures may be reckoned as about 18 or 20 per cent. Of course the duration is not as long as that which has been—arbitrarily, I admit—laid down as necessary for the admission of a complete cure. But, even setting aside this objection, I am not satisfied with the method which Mrs. Post has adopted of reckoning the percentage of cures. I believe the only fair method to be to compare the total number of cures of a certain duration (which shall be agreed upon, and which, for malignant disease, is generally accepted as a three-years' duration) with the total number of the cases of operation of which the history has been followed up, including the cases of death from the operation. A patient or friend of a patient, asking for information on the percentage of complete cures due to an operation, would certainly be surprised, after learning that it was 20 per cent., to discover that the calculation had been based only on the cases in which recovery from the operation had taken place, and that the mortality due to the operation was nearly 30 per cent.

One very important question must not be lost sight of in relation to these matters. It is the question of the necessity or desirability of extensive operations for the removal of disease of limited extent. The writer of a very interesting article in the *British Medical Journal* (ii. 1883, 837), after mentioning the success obtained by Dr. Baker of Boston, who claimed that of thirty patients treated by him by a very thorough operation, but only partial removal of the uterus through the vagina, six were alive and well five years subsequent to the operation, remarks: "If such results are attainable from partial operations, what may not naturally be expected from complete extirpation performed through the vagina at an early stage of the disease, when irregular and climacteric hæmorrhage is its first indication?" I venture to think, both on pathological and surgical grounds, that the success of partial extirpations will be always greater than that attained by complete extirpations. The facts, as they at present appear, are largely in favour of partial operations. Setting aside for the moment the difference in the mortality due to the two operations, the results in relation to the cure of the disease are thus far not brilliant for the complete operation, whereas they are really admirable for the partial operation. The percentage of cures recorded by Pawlick, and those which have just been referred to as having been obtained by Baker of Boston, compare favourably with the percentage of cures due to operations for malignant disease in any part of the body, with the exception of the lower lip. On pathological grounds the partial operation, in the case of cancer of the vaginal portion and of the cervix, is justified by the researches of Ruge and Veit to which reference has been made. These researches prove, certainly of many, if not of all, cases of cancer of the vaginal portion, that the disease does not tend to spread upwards to the body of the uterus. They also show that cancer of the cervix may remain long limited to the cervical portion and the surrounding tissues, although it may extend either upwards to the wall of the uterus or downwards to the vaginal portion. It is difficult to understand what advantage can be gained by removing the entire uterus by an avowedly difficult and dangerous operation, when a much less dangerous and scarcely difficult operation will accomplish thoroughly well the complete removal of the disease. I am strongly of opinion that this question of the removal of entire organs for the cure of cancer of one part of the organ requires reconsideration, and that the answer must rest on clearer evidence than that which has satisfied us heretofore. We make a rule of removing the whole breast in every case of cancer, no matter in what part of the organ the disease is situated, yet we are content to remove half the tongue for cancer seated on one border, and no one thinks of cutting away the entire lip, or even the whole of the prolabium, for cancer of the lip. Are the results of amputation of the breast for cancer so much better than those of removal of portions of the tongue and of the lower lip that we should dream for a moment of altering our practice in the treatment of cancers of the tongue and lip to bring it into harmony with our treatment of cancer of the breast? All the evidence which we at present possess is, so far as I can see, on the opposite side, and I think it far more likely that our practice will undergo a revolution in the contrary direction than that we shall push it farther in the direction of the removal of entire organs for malignant disease which is limited in extent, and only affects a small part of the organ, perhaps its extreme limit. I have expressed my opinion on the subject of the very extensive operations which have been of late years recommended in the chapter on the Breast. The question can only finally be decided by careful study of the course pursued by the cancers of different organs and parts of organs, with a view to discover in what direction they are prone to extend, and, second, by a careful study of the results obtained by operations which remove the disease with a wide area of the surrounding tissues, but do not extend to the entire removal of the organ in which the cancer lies. I contend for very free operations for the removal of cancer, but operations which are founded on the best possible knowledge we can obtain of the natural history of cancer of every part of the body on which we operate. At present many of our operations are planned and carried out without any attention to the peculiarities which the disease presents in the particular part of the body in which it grows, and I have frequently seen an operator remove the entire breast for the sake of a cancer the size of a small walnut, and yet only take away an area of the thickness of an eighth of an inch of the tissues immediately surrounding the disease, or even actually skirt the disease at one point. We have an impression, which amounts to little more than a prejudice, in favour of the complete removal of the breast. We are now in danger of falling into a similar error in the treatment of cancer of the uterus, and I trust that we shall consider the position very carefully before we commit ourselves to what may prove a terrible mistake. I am the more decided on this point because I see that many of the reported cases of complete removal of the uterus have been performed for the removal of disease of the vaginal portion.

Are patients who are not cured, relieved by operation? I think the answer to this question must depend on whether the operation has been successful in so completely removing the disease that no immediate recurrence takes place. With immediate recurrence all the distressing symptoms of the disease return—the hæmorrhage, the offensive discharge, the pain. But in those cases in which the patient remains free from all these symptoms for many months, or perhaps a year or more, the relief afforded by the operation cannot be denied. Certain points, however, must be borne in mind, not only with regard to patients who are only relieved by the operation, but with regard to those who are cured. Of these, perhaps the most important is the contraction of the orifice of the uterus in cases in which the portio vaginalis or the cervix has been removed. This has been referred to in the description of the operation with the galvano-cautery, and there the method of treating the mischief is described. There can be little question that some, if not many, of these women suffer from a permanent stricture of the orifice of the uterus which requires occasional dilatation with instruments or actual operation. Nevertheless, the annoyance, or even danger, to which women are subjected from this cause is as nothing compared with the present distress and prospective misery and death to which they are condemned by the cancerous disease for which the operation was performed. A great misfortune which occurs to some of the poor creatures who suffer from stricture of the uterus after operation is pregnancy. Every care should be taken to warn patients against incurring the distress and danger to which this subjects them. In spite of all that may be said, pregnancy will follow in some cases, sometimes to be succeeded by a natural delivery, sometimes requiring operative interference for the relief of the mother. The occurrence of pregnancy is scarcely to be wondered at when it is remembered that it is not at all unusual for women suffering from cancer of the uterus, and with many distinct symptoms of it, to become pregnant.

Results of Operations for Sarcoma.—The number of recorded cases of sarcoma of the uterus is yet so small, compared with those of carcinoma, that we are scarcely in a position to furnish accurate information on this point. Gusserow states that there does not at present exist a single instance, strictly considered, of the permanent cure of an undoubted sarcoma. All tumours of this kind have, sooner or later, caused death. Nevertheless, the prognosis is in some respects better than that of carcinoma. The course of sarcoma is, at least at first, slower; it is often discovered at an earlier period of the disease, and its course may be arrested, although perhaps not cured, by repeated operations.

I have here only quoted Gusserow; but the truth is, that the uterus has been removed, and the vaginal portion has been amputated, for sarcoma, according to the situation of the disease and its extent. The number of cases is small, and the number of patients who have been followed up after apparently successful operations is still smaller, so that no statistical information is yet available in reference to the results of operations on the disease.

Conclusions.—Malignant disease of the vaginal portion and of the lower part of the cervix should be removed by amputation of the affected parts in suitable cases.

The operation may be performed either with the galvano-cautery or with cutting instruments.

The prognosis is not bad for those cases in which the disease is limited in extent and easily accessible; it becomes worse as the disease extends to the wall of the vagina and surrounding tissues.

Even in these cases relief may often be afforded by operation.

Removal of the entire uterus should be limited to those cases in which the disease cannot be reached by supra-vaginal amputation.

Removal of the entire uterus should always be performed through the vagina when the condition of the parts and the size of the organ permit it.

Removal of the uterus through the abdominal incision should be limited to those cases in which the uterus is of very large size, the vagina is narrow and cannot be dilated; in which the uterus is pregnant; and where other complications prevent the vaginal operation. Immobility of the uterus, and signs indicating affection of the glands or other parts external to the uterus, contraindicate attempts at extirpation.

There is reason to hope that the removal of the uterus through the vagina will become less fatal and more successful as a means of cure as the method of performing the operation and the management of the cases are better understood. But there is no reason to believe that the removal of the entire uterus will take the place of partial amputation in those cases in which the disease is limited to those parts of the organ which can be reached through the vagina with comparative ease.

CHAPTER XXX.

OVARY.

THE study of the pathology of malignant tumours of the ovary is singularly difficult, on account of the occurrence of mixed forms of disease. Not only are mixed forms of sarcoma found growing in the ovary, but sarcoma tissue occurs mingled with fibrous and glandular tissues, as in the mamma. It is not improbable that sarcoma and carcinoma are occasionally combined; the characters of both sarcoma and carcinoma are apt to be altered by the presence of cysts; and dermoid and papillary growths, which, at first sight, appear to be innocent, are found to contain masses of malignant disease. The terms "malignant dermoid" and "malignant papillary" are well known to ovariotomists. The combination of malignant disease with dermoid growth is certainly very curious; but the fact that a papillary tumour should be malignant will not surprise any person who is familiar with the warty surfaces of many epitheliomata. The really curious facts in this connection are the frequency with which simple papillomata are said to become cancerous, and the great difficulty there is in many instances in determining, even with the tumour in one's hand, whether the disease is innocent or malignant. This difficulty has led Cohn, in his analysis of the malignant tumours of the ovary in Schroeder's clinic, to include among them all the cases of papillary tumours, whether innocent or malignant.

In the following short account of the general pathology of malignant ovarian tumours, I shall not enter into the question of their histogenesis, or of the exact relation which the varieties of the disease bear to each other, for these matters are not suited to the present subject. Those who are interested in them may satisfy their curiosity by studying the excellent papers and monographs of Olshausen, Coblenz, Cohn, Doran, Waldeyer, Flaischlen, and others.

For the benefit of those who wish to obtain a general view of the properties of the malignant tumours of the ovary, it may be said that both sarcoma and carcinoma may occur there. Contrary to the general rule, both diseases are observed with tolerable frequency during the early periods of life. This is not unusual in sarcoma, as a glance at most of the sections will show; but it is so unusual in the case of carcinoma that, were the statement not made by several independent observers, and confirmed by careful microscopical examinations, I should hold grave doubts of its accuracy. Even now I am induced to wonder whether some of the tumours which have been described as possessing a typical alveolar structure are, in truth, specimens of carcinoma. It has not occurred to me to enjoy the opportunity of myself *studying* any of the sections of these tumours, and I am therefore unable to express any other than a purely speculative opinion with regard to them. Both ovaries may be the seat of malignant disease. With the growth of the tumour there may be associated ascites, great enlargement of the abdomen, pressure on the intestines and bladder, with pain and general wasting. The tumour, whether it be solid or fluid, may attain a very large size, but, as might be expected, large size is more common in those cases in which the solid growth is combined with the presence of cysts. The duration of life may be several years or only a few months. In the case of a disease so situated, there will always be a difficulty in estimating the precise duration of the disease, much more than in the case of tumours situated in such organs as the breast and testis; and the difficulty is greatly increased on account of the uncertainty whether the disease was from the first of the same nature as that found after death. The common causes of death are marasmus and peritonitis, and Olshausen adds to these pleurisy and pulmonary embolism.

In the course of operation or after death the tumour is often found to have contracted adhesions to the surrounding structures. There may be secondary growths on the inner surface of the abdominal peritoneum, the glands may be affected, and secondary tumours may occur in the lungs, the liver, spleen, stomach, intestine, and other parts. Of the occurrence of secondary affection of the glands in connection with primary carcinoma of the ovary there appears to be no doubt, but statements are made that the glands are not usually affected in connection with primary sarcoma. Of the truth of this statement it is difficult to form a just opinion, partly from the reasons that have been already mentioned, partly from the fact that masses of disease in the abdomen which have been noted in association with, or after the removal of, primary sarcoma of the ovary have not been always or frequently attributed to their probable origin in the lymphatic glands. It has been assumed by some of the writers on the subject that, in accordance with the impression which still prevails that sarcoma does not affect lymphatic glands, the glands are not affected by primary sarcoma of the ovary. Owing to this circumstance, there has been in some instances, not a suppression of truth, but an oversight. There are, however, cases on record of considerable glandular enlargement in association with primary sarcoma of the ovary, and the enlargement has been of the glands situated in front of the spine.

There does not appear reason to believe that the course of a malignant tumour of the ovary is essentially altered by the fact that it is developed in connection with a cystic tumour, whether dermoid or simple cystic. It may be slower, or at least appear to be slower. For the malignant disease may not be developed until the original cystic disease has been in existence for a considerable period. But the inclusion of the malignant growth in the interior of a cyst does not apparently affect its relation to the lymphatic glands or to distant tissues and organs. I do not know how far it may influence its rapidity of progress or the relation of the tumour to the structures in the immediate vicinity; but I can well imagine that such a tumour may be slower to form adhesions to the surrounding textures (unless peritonitis is produced), and may therefore be more readily and safely removed than is the case with primary malignant growths of the ovary. But it is premature to speak decidedly on these questions.

Methods of Operation.—So far as I am aware, there is no essential difference in the preparatory or after treatment, or in the manner of conducting the operation itself, for malignant tumours of the ovary and innocent ovarian tumours, whether solid or cystic. There may, and probably will, be greater difficulties in the removal of a malignant tumour if the disease is firmly adherent to the surrounding structures or is associated with secondary growths of the neighbouring lymphatic glands, and an attempt is made to remove not only the primary but the associated tumours; but the essential steps of the operation are the same. I shall take the general account of the operation from Sir Spencer Wells, whose experience in ovarian surgery is unrivalled. It is not needful to describe minutely all the requisites for the sick-chamber which are detailed at p. 271 of his book (*Ovarian and Uterine Tumours*, 1882), except to say that the nurse must be able to pass a female catheter, for the urine has to be drawn off every six or eight hours, or even more frequently, after the operation.

The temperature of the room in which the operation is performed and in which the patient is kept afterwards should be about 65° or from that to 68°. The patient should wear her ordinary night-dress, warm woollen stockings, and a loose short flannel jacket. The rectum should be thoroughly cleared out by an injection of warm water, and no food should be administered for at least four hours before the operation. Sir S. Wells recommends that the time for the ovariotomy should be the afternoon about two or three o'clock rather than the early morning, as the patient is then likely to get a good sleep on the previous night. She should have a warm bath the evening before the operation, and the abdomen should be thoroughly cleansed with soap and water.

The patient, after emptying her bladder, may be allowed to walk into the operating-room. When she is placed on the table and the anæsthetic is administered, a broad strap is carried over the thighs just above the knees and fastened beneath the table, and the hands may be secured by means of a bandage. The whole body is covered with warm flannels or blankets. The abdomen is then covered by a waterproof sheet, with an opening about 8 inches long and 6 inches wide in the middle. The inner surface of the waterproof is spread with a coating of adhesive plaster of about an inch in width all round the opening so that it may adhere to the skin and prevent exposure of the patient, while her body and clothing are kept dry and clean.

The anæsthetic is, of course, to a large extent a matter for the chloroformist to decide; but Sir Spencer Wells prefers the bichloride of methylene, which he considers less dangerous during the operation and less likely to produce serious vomiting after it than chloroform. It is also free from the objection to ether, that it does not fill the whole room with the vapour.

A vertical incision is made in the middle of the linea alba for 2 or 3 inches in length a little below the umbilicus. The division between the recti muscles is, if possible, discovered, and the incision is carried between them. The various layers of the abdominal wall are divided until the peritoneum is reached, and this must be opened with care, especially in cases in which there is very little liquid in the abdominal cavity, so as to avoid wounding the tumour. A broad director is passed into the opening, and the peritoneum is divided along the whole length of the incision. In cutting down through the abdominal wall the bleeding vessels should either be ligatured or compressed with forceps, so that no blood runs into the cavity of the abdomen.

The tumour may now be examined, and its connections with the abdominal wall and perhaps with other structures made out. Adhesions may be separated with the finger or with as much of the hand as can be introduced. If, now, it appears probable that the disease can be removed, the incision may be lengthened with scissors or a probe-pointed bistoury, cysts (if they are present) may be emptied so as to reduce as far as possible the bulk of the tumour, and adhesions broken down. The greatest care is taken to prevent the contents of the cysts from running into the cavity of the abdomen. If the tumour is not of large size and is not adherent, it can be removed without difficulty. But if there are numerous and firm adhesions, the operation may be exceedingly difficult, and may be found, even when a long time has been spent on it, to be quite impossible. The bulk of the new growth may be taken away, but fragments of it may be so firmly adherent to the surrounding structures, or so intimately blended with the posterior wall of the abdominal cavity, that they cannot be removed. With the hope of completely ridding the patient of the disease, portions of the bladder, of the intestine, and other abdominal and pelvic organs have been removed. And, in other cases, the operation has been uncompleted, for larger or smaller masses of disease have been left behind. The difficulties which have been met with by the most experienced ovariotomists in dealing with malignant tumours of the ovary show how impossible it is to be sure, in early stages of the operation, while there is yet time to withdraw, of the exact connections and extent of the disease. Probably, the best course to pursue is to examine, as thoroughly as can be done with the hand through a 2 to 4 inch incision, the size of the tumour, its solidity or the presence of cysts, its relation to the viscera and to the posterior wall of the abdomen, and the presence of secondary deposits. Of the relation of the growth to the posterior abdominal wall something may be learned by its mobility, and, for secondary formations, the regions to search are the situation of the abdominal and pelvic glands, the surface of the intestines, and the inner aspect of the abdominal wall, where it is not unusual to find both innocent and malignant papillary growths. If the result of the examination is not decidedly satisfactory, and there is suspicion or certainty that the disease is firmly fixed or already disseminated, the operation should be abandoned before the life of the patient is seriously imperilled by a hopeless attempt to remove it. Even at a later stage, I believe it is better to abandon the operation than to cut away portions of the bladder and intestine, or to make a fruitless attempt to dissect away large masses of lymphatic glands.

Supposing all the adhesions to have been broken down or torn away, so that the tumour can be completely separated from the surrounding structures without serious damage, it is drawn carefully out of the abdomen, and a soft, flat sponge, some 6 inches long and 4 inches broad, is passed into the abdomen to prevent the escape of the intestines and the entrance of fluids into it. The pedicle, having been isolated, is ligatured by passing through it a long blunt-pointed needle slightly curved and armed with a long carbolized silk thread. The thread is divided into two, and each half is made to embrace one-half of the pedicle and very firmly tied. The last-tied ligature is usually made to encircle the whole thickness of the pedicle, and tied, so as to insure still greater safety. Before cutting through the pedicle, it is well to seize it on either side with clamp-forceps, so that its cut surface may be thoroughly examined before it is allowed to sink back into the abdomen. The forceps bite only the coverings of the pedicle, and do not, therefore, constrict the vessels. If there is no hæmorrhage, the ligatures are cut short and the clamps are removed. In some instances it is deemed expedient to leave one or both the ligatures, cut long, projecting through the abdominal wound, but this practice is not now common. Instead of tying the pedicle *en masse*, it may be secured with clamp-forceps before it is cut, and the vessels may be ligatured separately after division, carbolized or chromicized catgut or silk being employed for the purpose. In fact, the pedicle is treated much in the same manner as the spermatic cord in castration.

After the removal of the tumour, bleeding vessels are sought for and secured in the omentum and other parts, and the condition of the other ovary is examined. If it is obviously diseased, and there is reason to fear that the nature of the disease is similar to that in the first ovary, it should be removed.

The peritoneal cavity must now be thoroughly cleansed. If there is a large quantity of fluid, it can be in great part squeezed out by gentle pressure. The remainder is removed by introducing soft sponges, which are passed down behind and in front of the uterus, along each flank in front of the kidneys, and over the peritoneal surface. A sponge, to which a long piece of silk is attached, may be passed down into Douglas's pouch and allowed to remain there for a few minutes in order to collect fluid, while the other parts of the interior of the abdomen are cleansed.

When the cleansing of the abdomen appears to be complete, a flat soft sponge is placed in front of the intestines and omentum immediately behind the wound, and the sutures are inserted. The sutures which are usually employed are of Chinese silk, soaked previously in a 5 per cent. solution of carbolic acid. A suture 18 inches long is threaded at each end on a strong straight needle. Each needle is introduced from within outwards through the peritoneum and the entire thickness of the abdominal wall. Before the lips of the wound are drawn together, the inner surface is once more examined to see that no bleeding is taking place from the suture punctures, and the sponge is removed. The lips of the wound are then accurately brought together, the sutures tied and cut short.

It is very important, in closing the abdominal wall, to bring the peritoneum on both sides in close contact, for the union of the peritoneum takes place very quickly and prevents the entrance of discharges into the abdominal cavity.

The surface of the abdomen is thoroughly cleansed, the wound is dusted with iodoform or covered with antiseptic gauze or boracic wool. The abdomen is covered with cotton-wool, which may be supported and kept in place by broad strips of strapping, a flannel belt is adjusted round the body, and the patient is removed to bed. She is placed on her back, with the knees supported by a pillow, and is kept warm with warm blankets and hot bottles, if necessary. The room is darkened, and she is left alone with the nurse. If she is suffering much from collapse, the head should be kept low, and may be wrapped round with a warm shawl or flannel.

The general treatment of the patient after the operation consists in keeping her very quiet in a well-ventilated room, not too light; feeding her on barley-water, toast and water, and chicken-broth during the first two or three days, administering brandy or champagne if there are signs of exhaustion, &c. &c. The urine must be drawn off about every six hours with a silver catheter in order to prevent the action of the abdominal muscles. If there is much flatulence, it may be relieved by passing a tube 2 or 3 inches up the rectum. The bowels need not be opened by medicine, even if they are not naturally opened for a fortnight after the operation. Vomiting, which is sometimes very distressing, is treated by means of iced brandy or champagne, hydrocyanic acid, 15-grain doses of bromide of potassium, or draughts of hot water.

If all is going well, the wound need not be dressed until a week has elapsed, when the strapping is cut where it passes from the integuments on to the cotton-wool on either side. The dressings are removed, the surface of the abdomen carefully cleansed, and some simple antiseptic dressing re-applied. Cotton-wool is again laid down over the front of the abdomen, and fresh strips of strapping adjusted by fastening them on the strapping which was left on each side, so as to bring the two sides a little closer together, and thus prevent any tension on the wound. When the wound appears to be firmly united, the stitches are removed, but the abdomen must be supported by means of strapping for at least a fortnight after their removal, in order to guard against the tearing asunder of the edges by any sudden or forcible act.

It is not reasonable that I should here enter into an account of all the conditions which may complicate the after-treatment of a case of removal of a malignant tumour of the ovary, but there is one condition which must not be allowed to pass unnoticed. Sir S. Wells says: "When bad symptoms follow ovariotomy—pain, vomiting, fever with abdominal distension—the surgeon should suspect that some fluid, either serum, blood, or pus, is collecting in the peritoneal cavity. It may collect in such quantity as to give rise to sensible fluctuation from one side of the abdomen to the other; or it may gravitate to the bottom of Douglas's space, and form a tense swelling behind the uterus, easily felt through the vagina, although there may be no free fluid perceptible in the abdominal cavity." The latter condition may be treated by puncturing the swelling with a trocar, or passing a drainage-tube through the pouch so as to drain away the fluid through the vagina. Collection of fluid in the general abdominal cavity may be treated by opening the abdomen, cleansing it of the decomposing fluid, washing it thoroughly out with warm water, and either draining it through the lower end of the wound or completely closing the wound again. The prognosis in both cases is bad, but worse when the fluid is contained in the general cavity of the peritoneum.

The foregoing account of the operation and the general management of the patient has been taken almost exclusively from Sir

Spencer Wells's book, but is necessarily an abbreviated version. Much which is interesting has been omitted, but I believe nothing which is essential. I cannot pretend to deal with every difficulty which may be met with in the performance of the operation itself or in the after-treatment of the patient, or to occupy many pages in a consideration of the various methods of treating adhesions and of securing the pedicle. For example, I have not spoken of the clamp, the cautery, and the écraseur, all or any one of which may be employed in the securing of the pedicle. But I have given as straightforward an account as possible of the usual operation, such as may be useful to those who wish to get at the gist of the matter quickly.

I have no intention of entering into the questions of the relative value of various methods of operating, for these are discussed at length in many books and papers, and not always in the most agreeable spirit; but I shall refer shortly to two papers on account of their general bearing on the question of the best method of operation and after-treatment. The one is a paper by Mr. Knowsley Thornton, on "Antiseptic Abdominal Sections," in the *Transactions of the R. Medical and Chirurgical Society*, lxiv. 141 (1881); the other is a paper by Mr. Lawson Tait, on "One Hundred and Thirty-nine Consecutive Ovariotomies performed between January 1st, 1884, and December 31st, 1885, without a Death," in the *British Medical Journal*, 1886, i. 921.

Thornton's paper deals with 172 cases. The method of antiseptic surgery which was employed is not described in the text, but this expression is used on p. 140: "The cases have all been treated on one common plan, viz., by Lister's method. When I say this, I mean by *Lister's own method*, to the exclusion of all so-called *modified Listerism*. They have nearly all been also treated by complete intra-peritoneal ligature." Mr. Thornton shows a very definite and considerable reduction of the mortality, first comparing the "antiseptic" with the "non-antiseptic" operations, then comparing the first and last series of antiseptic cases. The mortality of the last series of seventy-five cases was only 4 per cent. But it is not by any means certain that this result was solely due to the Listerian method, so many other matters have to be taken into the account in weighing the relative mortality of series of cases of operation. Not the least of them is the increasing experience and skill of the operator. And large allowance must be made for the management of the pedicle, the management of adhesions, the character of the disease, the efficiency of the nursing, and many other circumstances which go to make successful series of operations. It is both amusing and instructive to compare with Mr. Thornton's paper the paper which immediately precedes it, by Dr. Granville Bantock, on "Hyperpyrexia after 'Listerian' Ovariotomy." The discussions between these two gentlemen are still warm, and I need not enter into them; but I cannot help pointing out that it is unfortunate for those who come after that the method which was adopted by Mr. Thornton was not described in full in the paper alluded to. The Listerian dressing of to-day is not the Listerian dressing of yesterday; and I am sure most surgeons would find it difficult at the present moment (last day of 1886) to describe exactly what is now meant by the Listerian method of operating. I confess I could not say whether Professor Lister himself still employs the spray or not, whether he uses carbolic acid or thymol or some other antiseptic, &c. &c. &c. Even in the reading of Mr. Thornton's paper I cannot but be struck with the fact that he found it expedient to abandon drainage, and I have totally failed to follow his ingenious arguments to explain why drainage is not needed in the application of pure Listerism to ovariotomy.

Mr. Lawson Tait lays very strong stress on the following points: —Short incisions in the abdominal wall, the application of dry absorbent cotton-wool (quite free from any kind of germicide) to the wound, the intra-peritoneal method of treating the pedicle, and washing the abdomen instead of sponging it. The short incision cannot be practised in most instances of malignant disease, on account of the solidity of the tumour. Mr. Tait has no fear of germs, of whatever kind or activity. He himself always uses the silk ligature, tied in a Staffordshire knot, for the securing of the pedicle, and prefers it to the cautery on account of its universal application, whereas the cautery cannot "be employed for intra-pelvic work." He fills the abdomen with blood-warm water, washes all the organs, and repeats this till the water comes off clear. With regard to the water, he says: "And I wish to say that the water used has not been boiled, and contains no drug or chemical substance beyond what is stated in the Report of the medical officer of health for the borough. The water is plain unfiltered tap-water, warmed by the addition of enough from the boiler. It is full of germs, and spores, and small beasts of thirty-four different varieties, according to a careful Report of Dr. Alfred

Hill, published some few years ago." The only other statement in this paper which need be noticed is that which refers to the treatment of peritonitis after operation. It runs thus:—"On the slightest indication of peritonitis after an ovariotomy, we give a rapidly acting purgative, it matters not what; the patient's bowels are moved, and the peritonitis disappears. This practice I introduced in 1875, and it is now almost uniformly adopted. How different from the views we had drilled into us years ago, that opium was the sheet-anchor of the practitioner in all abdominal troubles, when I say now that all opiates are forbidden in my practice, unless they be required to ease a dying patient out of the world." Although I have no admiration for Mr. Tait's writings, it is impossible to pass over the statements contained in this paper without notice. The success which he claims is so splendid that his description of his method demands attention. I confess, however, that I shall feel more satisfied when it has proved equally successful, or even very successful, in the hands of other surgeons.

In the application of ovariotomy to the removal of a malignant tumour there is not the least necessity to depart from the ordinary rules which guide either the performance of the operation or the preliminary or after treatment of the patient. But certain points must be borne in mind. A much longer incision is almost always required for the removal of a malignant tumour; and, if the tumour is, as is frequently the case, solid, the incision may need to be very long. The danger of the operation is generally said to be increased by long incisions; but the truth is that long incisions are usually rendered necessary by extreme difficulty in dealing with the tumour, and the increased danger of the operation does not depend merely on the increased length of the incision. Of course it is quite conceivable that a long incision might be needed for the removal of a large, solid, malignant tumour of the ovary which presented no other difficulty in removal than its large size, and the operation might consequently not be more dangerous to the life of the patient than that which is performed for the removal of a simple ovarian cyst. Again, the bulk of the tumour may render imperative a longer incision than usual for the mere purpose of thorough examination of the interior of the abdomen. There is an impression in some quarters that greater risk is justifiable in an operation for the removal of malignant disease than in a similar operation for innocent disease. I hold the contrary opinion, not merely with regard to ovarian malignant tumours, but with regard to operations for the removal of malignant disease of other parts of the body. And I should say of a malignant ovarian tumour, that conditions which would make one hesitate to attempt or proceed with the removal of an innocent tumour of the ovary ought to lead one to refuse to operate or to desist from further attempt in the case of a malignant tumour. Extreme difficulty in the removal of a malignant tumour, for the most part, means great danger to life; great difficulty in the removal of a malignant tumour also means, for the most part, small probability of such complete removal as shall insure, or offer a reasonable prospect of, long immunity from the disease; therefore, the greater the danger to life from the operation, so much the smaller, in the large majority of cases, the prospect of cure if the patient recovers from the operation.

Results of Operations.—Before entering on the questions of the mortality of operations for the removal of malignant tumours of the ovary and the cases of cure, it may be well to mention that, after a careful study of the tables and text of Sir Spencer Wells's *Ovarian and Uterine Tumours*, I found it impossible to determine the number of instances in which the great leader of ovarian surgery had operated for malignant disease of the ovary. I therefore communicated with Sir Spencer Wells, and later held a long conversation with him on the subject of the removal of malignant disease of the ovary. He took so much interest in the matter that he was kind enough to look out the notes of many of his cases and read them to me. We found it impossible, however, to arrive at a thoroughly correct estimate of the relation of the malignant to the innocent tumours. The period in which the earlier operations were performed, the uncertainty which then prevailed regarding the pathology of ovarian tumours, the difficulty of distinguishing before or even after removal, in many instances, between some forms of innocent and malignant tumour, made it quite impossible to use the material for the purposes of this work.

A reference to the tables in the *Ovarian and Uterine Tumours* shows plainly that a certain number of operations were performed for malignant disease, for in some of the cases in which death resulted from the operation the case is noted as "cancer." In other cases the disease was probably malignant, for the patient was known to have died of malignant disease within a few months of the operation. In other cases, again, it may have been malignant, but was not certainly so, for the death of the patient from malignant disease did not occur until from one to two years after the performance of the ovariotomy. But if one were to judge of the results of operations for malignant disease by these tables, it would appear that all the persons who were treated died either of the immediate effects of the operation or within a short time after it from recurrence of the disease. There is no account of any case in which the disease was diagnosed as malignant at the time of the operation and in which the patient is reported as well long afterwards.

In conversation with Sir Spencer Wells I learned that he thought that the proportion of solid to fluid tumours in his own practice had been much less than had occurred in the practice of Mr. Thornton, and he was much surprised at the large number of cases of malignant disease which Professor Schroeder had seen in his clinic (see Cohn's paper in the *Zeitschrift für Geburtshülfe und Gynäkologie*, xii. 14, 1886: "Die bösartigen Geschwülste der Eierstocke"). He pointed out to me, what is indeed very evident from a perusal of Cohn's paper, how very difficult it is to distinguish with the naked eye between some forms of innocent and malignant tumour; and I can add, from my own knowledge and the experience of others, that the microscope is not always successful in determining whether a tumour is innocent or malignant, much less the particular form of malignancy. A knowledge of these circumstances must naturally influence our acceptance of any statistics relating to ovariotomy for malignant tumours of the ovary, and it will probably be many years before our information on the subject is so precise and trustworthy as that which we possess of the relations of surgery to the malignant diseases of many other parts of the body. Such information as lies before me, however, shall be given.

Mortality due to the Operation.—I have put together a total of seventy-eight cases of malignant disease of various kinds drawn from the following sources:—The paper by Cohn, mentioned above; Olshausen's "Die Krankheiten der Ovarien," in the *Deutsche Chirurgie* (Lieferung lviii.); and a series of papers by Knowsley Thornton, on "Solid Ovarian Tumours," in the *Medical Times and Gazette* (1881, ii., and 1883, i.). Cohn's paper is based on the study of one hundred cases from Professor Schroeder's clinic, in eighty-six of which operations were completed. But for our purpose it is necessary to subtract from the list of completed operations those cases in which it is not certain whether or no the tumour was malignant—such, for example, as the "benign" papillary proliferating cysts and the "suspected" malignant growths. The total number of his cases is thus reduced to fifty-five, which is still a very large number, far exceeding that which has been forthcoming from any other clinic. They comprise ten cases of sarcoma, eleven of carcinoma, fourteen of carcinomatous proliferating cysts, one of dermoid sarcoma, two of dermoid carcinoma, three of myxoma, fourteen of malignant papillary proliferating cysts. Olshausen's cases were thirteen in number, all cases of sarcoma. Thornton's were ten, of which one was a case of carcinoma, the remaining nine all of sarcoma.

There is no reason why twenty-one cases from Billroth's clinic should not be added to these seventy-eight, although there are no further details of them than a statement to the effect that fourteen of them were cases of carcinoma, seven of sarcoma. The general statement was made by Professor Billroth in a letter to Sir Spencer Wells in 1881, published in the work I have alluded to (p. 235).

Of Schroeder's cases, thirteen were fatal, namely, three of sarcoma, four of carcinoma, two carcinomatous proliferating cyst, two myxoma, two malignant papillary proliferating cyst.

Of Olshausen's patients, three died of causes connected with the operation.

Of Thornton's patients, three died of the operation. One of the fatal cases was the case of carcinoma, the two others were of sarcoma.

Billroth lost fourteen of his twenty-one patients. The disease in eleven of the fatal cases was carcinoma, in three sarcoma.

The mortality in the whole of the ninety-nine cases was therefore thirty-three—as nearly as possible a percentage of 33, a very large mortality when compared with the general statistics of ovariotomy. And if the results of ovariotomy performed by the same surgeons for the removal of innocent tumours is compared with the results of their operations for malignant disease, it will be found that the mortality in the latter cases far exceeds that in the former.

Of the causes of death I have information only in eighteen of the thirty-three cases. They were as follow:—Sepsis, six; shock, four; collapse, three; hæmorrhage, two; marasmus, one; intestinal obstruction, one; sloughing of the pedicle, one. In three of these eighteen cases there was already more or less extensive secondary disease in the abdomen or other parts of the body at the time of the operation, as the autopsy proved. The causes of death generally are of the same kind as those which prove fatal after the performance of ovariotomy for innocent tumours, but the proportion of deaths from sepsis is much larger than would at this moment be regarded as reasonable. For sepsis, we may take it, is now of rare occurrence in ovariotomy.

It does not at first sight appear why ovariotomy for malignant disease should be so much more fatal than the same operation for an innocent tumour. But a perusal of such descriptions of individual operations as those of Thornton and Olshausen is a sufficient explanation. The extent of the disease is often considerable: the number and intensity of the adhesions, and the infiltration of the surrounding structures, in addition to the actual secondary growths of the glands and other organs, offer grave obstacles to the performance of the operation. Billroth says:—"Three weeks ago I operated on a carcinoma of the ovary, which had grown through small intestine and the bladder. I cut away 8 centimètres of small intestine, completed the enteroraphy; then I cut away the upper part of the bladder and united it with twenty sutures. The recovery was as free from fever as in the simplest case, and the patient was discharged cured after twenty days" (letter to Sir S. Wells). The result in this case was much happier than could have been hoped. Thornton, in commenting upon his cases of solid tumours, says:—"My experience, not only in these particular cases, but in what I have seen in the practice of others, would lead me to the opinion that the immediate danger to the patient is greater than in ordinary ovariotomies, whether complicated or uncomplicated, and this is what one would expect when one considers that the patient's general constitutional condition is already depressed, and that frequently ligatures have to be applied on and among unhealthy tissues, portions of such tissue also having sometimes to be left behind more or less damaged, and with its nutrition impaired. My own ten cases illustrate this increased immediate mortality distinctly, for three out of the ten died from the operation —a mortality triple that of my whole series of cases, six times as great as that of my recent work, and thirty times as great as that of my simple cases, in which my mortality is nil."

Cures due to Operation.—The results in the fifty-five cases reported from Schroeder's clinic are as follow:—Thirteen died of the effects of the operation, sixteen were dead or dying of recurrence of the disease at the time of the report, eleven had been lost sight of, and fifteen were reported as well and free from disease. In six of these fifteen cases the period after the operation was less than a year; in the remaining nine it was from one to four and a half years. In four of these cases (carcinoma three, sarcoma one) the period was from one to two years; in one case (malignant papillary proliferating cyst) it was from two to three years; in two cases (carcinomatous proliferating cysts) it was three years; in one (sarcoma), four years; and in one (dermoid sarcoma), four and a half years. There are thus four instances in which the period of freedom from disease was more than three years.

Olshausen does not record a single instance in which a complete cure can be claimed. His total results were:—Three died of the operation, one was dead or dying of recurrence, seven were lost sight of, and two were alive and well when last heard of at periods of six and twelve months respectively after the operation. It has been already stated that the disease in all these cases was sarcoma.

Of Thornton's patients, three died of the operation, six were dead or dying of recurrence at the end of from a few months to eighteen months, and one (who had a child at the end of two years) was alive and well full three years after the operation. This also was a case of sarcoma. Indeed, all Thornton's cases, with the exception of one, were cases of sarcoma.

Of Billroth's cases I have no further knowledge than the bare numbers which have been quoted.

It will thus be seen that five of forty-seven patients whose cases were followed were alive and well at least three years after the completion of the operation. Further, there were thirteen patients who were alive and free from disease at the end of from a few months to three years after the operation. And eighteen patients had been lost sight of after they had recovered from the operation.

I do not think it is possible to offer any trustworthy opinion regarding the relative malignancy of the various kinds of malignant tumour at present, on account of the different classifications which are employed and the very great difficulty in deciding between the alveolar sarcomata and the carcinomata. What is termed carcinoma by one observer is regarded as alveolar sarcoma by another. There appears to be a general impression that carcinoma of the ovary is more malignant than sarcoma, but it is not easy to decide on the correctness of this impression.

Nor is there sufficient material within reach to permit a definite opinion to be expressed regarding the cases which are most likely to be permanently successful. But the experience of malignant disease in other parts of the body is almost certain to serve for malignant tumours of the ovary, namely, that the cases are likely to recover most certainly and quickly from the operation and to be crowned with permanent success in which the tumour is of slow growth, of comparatively small size, perfectly circumscribed, little or not at all adherent, not associated with affection of the glands or any of the internal organs.

Are patients who are not cured, benefited by operation? On this question some difference of opinion may be found. My own feeling is to answer it in the affirmative. The number of instances in which the patient cannot be regarded as beyond a reasonable prospect of recurrence of the disease, yet has been well and perfectly comfortable for several or many months after operation, is so large that it is impossible to deny that these patients have been rendered happier and better by the operation.

On the other hand, if the disease recurs rapidly, the later sufferings of the patient may be as great as if no operation had been performed. In reference to this point I may again quote Thornton:—"Of the four who made good recoveries, one died within the year from peritoneal recurrence, and the other three all died within the twelve months with diffuse sarcomata in various external and internal situations and in the glands. This rapid and general diffusion of sarcomata of the ovary after operations for their removal seems to me to make it extremely doubtful whether it is not a positive injustice and cruelty to the patient to operate at all, for their sufferings from the many tumours are undoubtedly greater than they would be from the ovarian growths left alone. Their lives are, it is true, prolonged for a few months, but the period of actual health is very short. Still, in case 4, which appeared as hopeless as any case well could, the patient has enjoyed eighteen months of good health, much better than any she had enjoyed for years; and in the one really satisfactory case the patient not only remains well, but has become again a mother. No case could have looked more hopeless than this one did, and the tumour was of a kind in which one would have feared early recurrence. In considering the cases of patients doomed to speedy death if not operated upon, one such result as this out of ten comparative failures is not to be despised, and so I think I shall be inclined still to give the patient the chance of operation, unless there is such distinct evidence of spread of the disease into broad ligament or neighbouring parts that complete removal is out of the question."

The cases which have been quoted from the practice of several observers lead me to hold the opinion that the reasons for attempting to remove malignant ovarian tumours are as strong as those which lead surgeons to operate for malignant disease in most other parts of the body.

Conclusions.—From the evidence which has been adduced I think the following conclusions are justified :—

That malignant disease of the ovary, of whatever kind, should be treated by operation on the same principles as are applied to the surgical treatment of malignant disease of other parts of the body.

That the operation should be performed at the earliest possible period in cases of suspected malignant disease.

That the operation should in all instances be, in the first instance, exploratory, with a view to discover the extent and circumstances of the disease.

If the disease is found to be circumscribed, and not adherent or only slightly adherent to the surrounding structures, it should be removed, and the removal will be attended by a good prospect of recovery and a small prospect of permanent success.

If, on the other hand, the tumour has infiltrated the broad ligament, or is firmly adherent to important neighbouring structures so that these must be seriously injured in the attempt to remove it, or is associated with affection of the lymphatic glands or other secondary growths, the attempt at removal should not be made.

Recurrent disease is, in almost all cases, beyond the reach of operation.

It is not improbable that malignant tumours of the ovary have been removed in a number of instances under the impression that they were innocent. Of the results of such operations we have no means of judging, but it may be inferred that they are likely to prove some of the most successful in every respect.

CHAPTER XXXI.

BREAST.

The breast is subject to many different varieties of malignant tumour; but some of these, the myxomas and colloid carcinomas, are of rare occurrence, while others, the hard and soft carcinomas and the sarcomas, are so common that they naturally absorb the attention of those interested in the results of operative surgery. For our purpose it is not needful to describe the different varieties of sarcoma or even the hard and soft carcinomas separately.

Again, although the male breast is subject to the same kind of tumours as the female breast, the number of cases occurring in males is so small in comparison with the number occurring in females that the male cases may be left out of the consideration.

Sarcoma, of whatever variety, attacks the breasts of adult women almost invariably, yet cases are on record in which young girls or even children have been victims of the disease. Further, women beyond thirty and forty years of age are more liable to sarcoma than younger women. The tumour often commences in the same manner, and bears exactly the same characters, as an innocent fibrous tumour. It is at first perfectly circumscribed, very freely movable, not adherent even to the mammary gland. It is usually a nodular or tuberose, firm tumour, perhaps rather less firm than a fibrous tumour. There is no retraction of the nipple, no dimpling of the skin. The rate of growth is in the beginning not more rapid than that of many fibrous tumours, but, on the other hand, some of the sarcomas grow from the first with great rapidity, and are recognized chiefly by the rapidity of their growth. If the tumour contains no cysts, it may retain the characters which it first presented, and, even though it attains a considerable size, may be independent of the skin, the muscle, and even of the mammary gland. In this condition it may be removed, and even then, until a microscopical examination has been made, may be mistaken for an innocent growth; for most sarcomas are, in their first appearance, encapsuled, and many of them present on section the aspect of a simple fibrous tumour. Although the removal of the tumour is, so far as can be told, perfectly performed—indeed, it shells out easily in its capsule—yet within a few months or a year a second growth slowly forms near the scar of the operation. The recurrent growth differs from the primary tumour in some important respects: it is not so circumscribed, or, if it be so, is not nearly so freely movable; it is often visibly adherent to the skin at or near the scar, and is seldom so separable from the mammary gland. It usually grows more rapidly than the primary disease, and may in a short time form a mass of considerable size. Nevertheless, it may be easy to remove it, for it is easy to distinguish the substance of the tumour from the normal structures, and not difficult to dissect it out, although there is now no capsule, as there was to the primary tumour. The adherent skin is of course removed with the growth, and the same precaution is employed in the management of all other structures which are in the least degree suspect. Yet, after a longer or shorter period, there is a third formation of sarcoma, which may resemble the second growth, or may be even more menacing. In all probability the entire breast is now removed, or perhaps this was done in the removal of the second tumour, and by this means a further development of sarcoma may be averted. But this is not by any means certain; recurrence may follow recurrence until the infiltration of many and deeply seated parts—the penetration of the chest-wall, for example—may render any further operation impossible, and the patient at length dies, worn out by the suppuration of an ulcerated mass. In all this formation and re-formation of sarcomatous disease, it must be noted that there is very seldom, and as if only by accident, affection of the axillary or cervical lymphatic glands. There may, on the other hand, be secondary disease of one or more of the internal organs or distant parts of the body, for dissemination is not uncommon.

In women after forty years of age, mammary sarcomata frequently contain cysts, and, within the cysts, intra-cystic growths; and although these conditions produce marked and curious effects on the course of the disease in the breast, they do not alter in the least degree its essential nature. The primary disease usually enlarges much more rapidly than the sarcomas which contain no cysts, and the surface of the tumour may present large and numerous fluctuating bosses. In the course of time, one or more of these bosses may cease to fluctuate, may assume much more threatening characters than previously, may give way and extrude a bleeding fungous mass—the intra-cystic growth which it contained. Proliferous cystic sarcomas, particularly those which are thus ulcerated and fungating, present a much more formidable aspect than the non-cystic tumours, and, in consequence, the first removal of the tumour is much more likely to be very free. They recur, however, in the same manner as the non-cystic tumours, gradually affect the deeper structures, and in time kill in the same manner, by suppuration or by the formation of secondary tumours; but the lymphatic glands are not more liable to be diseased than in the case of the sarcomas which are not cystic.

The duration of life of women affected by sarcoma of the breast varies within the widest limits: it is seldom less than a year, and much more likely to be several years, while cases are on record in which recurrent tumours have been removed as many as fifteen or twenty times in the course of many years.

Carcinoma is, even more than sarcoma, a disease of adult life, rarely occurring in persons under thirty years of age, and becoming much more frequent after forty years are passed. The ordinary hard tumour, which may, notwithstanding its hardness, present to the microscope the large alveoli and numerous cells of medullary carcinoma, commences as an indurated nodule in some part of the mammary gland, with which from the first it is so intimately connected (being, indeed, to all intents merely a transformed portion of the gland) that it cannot be moved separately from it. Yet its mobility may be very considerable, for the gland itself is very freely movable in the fat beneath the skin and over the pectoral muscle. It is only when an attempt is made to move the tumour apart from the gland that the two are found to be inseparable. The nodule is not so clearly defined and circumscribed as a sarcoma or a fibrous tumour. It increases in size, often with rapidity, but the rate of growth is very variable; and, with its enlargement, it becomes slowly adherent to the integument and, later, to the pectoral muscle. The first intimation of attachment to the skin is a slight dimpling over the tumour, but in the course of time the new growth and skin become so closely fixed together that it is impossible to separate them, and the skin is distinctly infiltrated by the cancer. If the disease is left to itself, ulceration may take place, with the formation of a deep foul cavity which appears to be dug out of the new growth. The nipple is often retracted, and the integument for some distance around the tumour may be the seat of numerous nodules set in the skin and subcutaneous tissue. These nodules may be as white as the natural skin, but they are frequently tinged with red, or even dull-red or livid. They are not connected with the original growth by any visible cords or lines, and in some rare instances they extend widely over the surface of the chest, pass over the shoulder, and cover a large area of the back, so that I have counted considerably more than a hundred of them on the surface of the body. They are probably due to the travelling of the germs (?) of the cancer in the superficial network of lymphatics, at certain points of which, where perhaps there is greater obstruction to their free passage or some special advantage offered to development, the formation of small separate tumours takes place.

Usually, within a few months of the first appearance of the tumour in the breast the lymphatic glands in the axilla become enlarged, but the glandular affection may be deferred for a very much longer period, and may not occur for two, three, or more years. Indeed, there are cases on record in which the primary disease has been in existence for as many as ten or more years without any affection of the axillary glands. Such cases are, of course, remarkable exceptions to the general rule. In addition to the glands in the axilla, those beneath the clavicle and those in the neck may become enlarged and cancerous. Secondary tumours may form in the liver, the lungs, and other internal organs, as well as in the bones, particularly those of the spine.

In some rare instances both breasts are simultaneously affected, or are affected one soon after the other.

The cause of death in carcinoma of the breast may be exhaustion from ulceration and hæmorrhage, or the formation of secondary deposits; or the primary tumour may extend into the pleural cavity and produce pleurisy, with effusion, &c. &c. The duration of life without operation may be roughly estimated at from two to three years.

The natural course of the disease is, as might be expected, liable to considerable alteration if the primary tumour is removed. It is so customary to remove the entire breast that the word "removal" is almost synonymous with "amputation of the breast." The operation may be followed by complete recovery, and the patient may live for many years in perfect health. But in a large number of instances recurrence takes place within a few months or a year, and one or more nodules appear in the neighbourhood of the scar. In a few cases there is no recurrence until after the lapse of two, three, or more years. And, again, there are cases in which there is no recurrence of the disease in the breast or in the neighbourhood of the scar, but the glands in the axilla, which were apparently quite healthy at the time of the operation on the breast, become enlarged and cancerous. In those cases in which the glands were distinctly affected at the time of the amputation of the breast, and the operation was extended to remove them, recurrence may take place either in the breast or in the axilla. Also, in those cases in which the glands have been removed by a second operation separately from the breast, the recurrence may take place either in the region of the breast or in the axilla. A second operation may be practised, and even a third, for the removal of recurrent disease, and each operation may be followed by another outbreak of cancer, until at length it is no longer possible to remove the local disease without intruding on the pleural cavity. To complete the list of possible occurrences from a practical standpoint, the operation may be so far successful that there may be no recurrence in the parts from which the disease was removed, either in the region of the breast or in the axilla, but the patient may die of internal cancer which is connected with the primary disease, but which never appears externally, and therefore never produces the distress of an ulcerated and stinking mass.

It is necessary to modify the above description to meet the case of colloid and atrophying scirrhous cancer.

Colloid carcinoma occurs in women at about the same age and under precisely the same conditions as the ordinary hard carcinoma, and pursues essentially the same course. Nor is this to be wondered at, for it is probable that the only difference between the ordinary carcinoma and the colloid cancer is that which is due to transformation of the tissues of the former by what is termed colloid degeneration. The effect of this colloid change is, however, to delay the course of the disease, yet without tending to spontaneous cure. The adhesion of the tumour to the surrounding structures, the affection of the axillary glands, the formation of nodules in the integument, the occurrence of secondary deposits in other organs and tissues—all these circumstances may be observed, but they are spread over a much longer period of time, so that Gross estimates the duration of life in colloid cancer as twelve years instead of the two or three years, which is the average duration of cases of ordinary carcinoma of the breast. Further, although the disease does not appear to undergo spontaneous cure, or even to tend towards it, colloid carcinoma seems to be more easily cured by operation than the ordinary forms of cancer.

The case is very different with *atrophying scirrhous*, a term which I use in the manner in which it is employed by Gross to indicate not merely a hard tumour, but a tumour which is actually atrophic, so that the cancerous breast, instead of being larger than the natural breast, is usually much smaller, and may be even completely levelled down, yet as distinctly cancerous as if a large new growth were present. It is necessary to speak of this class of disease as "atrophying," if it is to be distinguished from other carcinomas of the breast, for the term scirrhous has been applied to all tumours which feel hard, and is in fact synonymous with the term "hard carcinoma." The reason for mentioning these atrophying tumours separately is that the very change which might appear likely to affect the new growth to the advantage of the patient, namely, the atrophy and destruction of its elements, appears to exercise a contrary effect upon it, except in so far as the duration of life is concerned in those cases in which no operation has been practised. The tumour becomes adherent at an early date, both to the skin and to the pectoral muscle; the axillary glands become enlarged; the tumour is very liable to ulcerate; and there is just as great a tendency to the production of secondary tumours as in the case of the ordinary carcinomas. From the study of a number of cases, Gross has come to the conclusion (*Tumors of the Mammary Gland;* London, 1880) that the duration of life in cases of atrophying scirrhous is about four years; that operation is practically useless as a means of curing the disease; and that the duration of life in the operated cases is about a year and a half instead of four years. If further researches establish this statement, we shall at least possess valuable knowledge regarding the class of cases of cancer of the breast which should not be treated by operation; but I think the matter should receive renewed attention at the hands of pathologists before a definite opinion is given on this point.

Methods of Operation.—It will be convenient to divide this part of the subject into—(1) Operations for the removal of the tumour; (2) Operations for the removal of the breast, including the tumour; (3) Operations for the removal of the lymphatic glands, either at the same time or after the removal of the breast.

1. *Operations for the Removal of the Tumour.*—It is so contrary to surgical custom to limit the removal of a carcinoma to the mere removal of the tumour that the cases in which the tumour alone is removed are almost always cases of sarcoma. Even in these cases many surgeons prefer to remove the entire breast, but the difficulty of deciding whether the disease is innocent or malignant is frequently so great that the question can only be decided certainly by the microscope. Within the last few weeks I have removed such a tumour from a woman forty years of age in whose breast it had been noticed scarcely longer than a month. The description of the operation will serve for the description of the method of removing such tumours. The tumour was about the size of a large walnut or larger, lay in the midst of the mammary gland below the nipple, and there presented the characters of spheroidal shape, perfect circumscription, very free mobility, absence of adhesion to the integument and even to the gland, and a firmness which amounted almost to hardness. I suspected, from the short time it had been noticed (in a small lax breast, in which any abnormality would easily be discerned) and from the age of the patient, that the disease was probably sarcomatous; but the freedom with which it could be moved from one part of the mamma to another determined me to limit the operation to the removal of the tumour. When the patient was thoroughly under the influence of anæsthetic, a single incision was made, in a line radiating from the nipple, down to the tumour; a few strokes of the knife served to lay it completely bare, and it shelled out easily in its firm capsule. One or two small vessels were ligatured with catgut which had been chromicized; the wound was washed carefully with a solution of carbolic acid, the edges were brought together by means of two or three soft silver-wire sutures except at the lowest part, where a slip of gutta-percha tissue which had been put into the cavity was allowed to protrude. A dressing of sanitas oil on lint was applied, covered with a thick layer of cotton-wool, and the whole was firmly bandaged against the chest-wall. Healing by the first intention took place except at the opening through which the tissue protruded; and, when this was taken out at the end of three days, the opening closed and the healing was entirely accomplished within a week.

If an operation for malignant disease is limited to the removal of the disease without any of the surrounding tissues, the method which has been just described will perfectly suffice. Of course it is possible to perform the removal with caustics, but this method does not commend itself, and I shall defer what I have to say on the matter of caustics to the next section, in which the removal of the breast is described.

2. *Operations for the Removal of the Breast, including the Tumour.*—Space will not permit me to describe all the various methods which have been or are employed for the removal of the breast, and I shall therefore limit myself to those operations which are commonly employed, and shall omit the description of such methods as the application of an elastic ligature, the use of scissors under the ether spray, and other similar modes.

Amputation of the Breast with the Knife, whether performed for sarcoma or carcinoma, generally includes the removal of an elliptical portion of the integument, with the nipple and areola, as well as the whole of the mammary gland and the soft fat and connective tissue in which it lies. The patient having been placed thoroughly under the influence of an anæsthetic, the breast is laid bare, and washed over with a solution of carbolic acid or some other antiseptic ; or, better still, the integument of the mammary area is washed thoroughly on the day previous to the operation, and is then kept covered with an antiseptic solution until the time for the removal of the mamma. The arm is drawn away from the chest and kept away during the operation. The surgeon stands on the same side as the affected breast, and his assistant on the opposite side of the table. ith a breast-knife a curved incision is made from the sternal side of the breast, below the nipple, in a direction upwards and towards the axilla. When the skin and subcutaneous tissue have been divided, the dissection is carried around the lower part of the gland, so as to separate it first from the skin-flap, then from the pectoral muscle. The fascia covering the muscle may be left or may be removed with the breast. By successive strokes of the knife in the direction of the fibres of the pectoral muscle, the breast is quickly raised from off the surface of the muscle. The mass is then grasped firmly in the left hand of the operator, and a second curved incision is made through the integument, from the lower to the upper corner, in such a manner as to include the nipple, areola, and as large an elliptical portion of the skin as is deemed desirable. From the subcutaneous tissue the dissection is carried round beneath the upper flap until it reaches the pectoral muscle, meets the first incision, and the breast is removed. The bleeding, which is often profuse, may be arrested by ligaturing the vessels as they are cut, but this delays the operation; it is therefore better for the assistant to apply Wells's clamp-forceps to each vessel as it is divided. When the mass has been removed, the vessels are ligatured with carbolized catgut. Great care is taken to secure every bleeding point, the wound is sponged out two or three times with a strong solution of carbolic acid, the edges are accurately brought together with silver-wire sutures, and a piece of gutta-percha tissue or a small drainage-tube is inserted either at one or at both ends of the wound. A dressing of lint, soaked in carbolic or sanitas oil, is applied, over which a pad of several layers of lint is placed, and these are fastened down with broad strips of plaster. Outside or beneath the plaster a thick layer of cotton-wool is generally laid, and the whole is bandaged firmly against the wall of the chest. The arm is usually placed by the side of the patient before the wound is sewn up, because the flaps can then be more easily brought together. When the dressings have been applied, it is bound closely against the chest-wall by means of a few turns of a bandage, and the patient is put back in bed with usually a pillow beneath the elbow of the arm of the affected side.

I have here described the operation as I have been in the habit of performing it myself.

Although the Listerian dressing is not employed, it will be seen that great care is taken that the operation shall be performed antiseptically, and I am exceedingly careful of the state of the instruments used, and of the cleanliness of all the surroundings of the operation.

The wound is dressed either the day or two days after the operation. The bandages and dressings are removed and reapplied with the utmost care not to disturb the patient. The surface of the skin is gently wiped over with a piece of carbolized gauze dipped in carbolic lotion; and, if there is any fœtor (which is an exceedingly rare occurrence), a little iodoform is sprinkled along the margins of the flaps, and similar dressings to those which were removed are again applied. Usually, after this the dressing is changed once every day; the drainage-tube or tissue is taken out at the end of three or four days, the sutures for the most part within a week. The patient is not allowed to move the arm or to sit up until the wound is quite healed along the whole, or almost the whole, of its extent.

It is natural to expect that modifications of the operation I have described will be required in individual instances, but they are not numerous or important. Among them are the necessity of widening the ellipse included between the two skin incisions for the purpose of including a dimpled or actually adherent portion of the integument; the necessity for removal of a suspicious or affected portion of the pectoral muscle; the need for the insertion of deep strong silver sutures or button-sutures when the edges of the flaps are wider apart than usual, &c. &c.

I might here describe the much more formidable operation recommended by Dr. Gross and Mr. Mitchell Banks, but it will be better to consider it in the next section, in which the opening of the axilla is discussed.

Removal by Caustics.—Instead of giving an account of several different kinds of caustic which have been used for this purpose, and stating in general terms the manner in which they may be employed, I prefer to take one of them as an example, and to describe in detail the manner in which it is recommended by the author to be used. Caustics have fallen so much into the hands of quacks, both in the profession and out of it, that it is difficult to obtain a satisfactory account of what has been done by their use, or to find anything like a scientific treatise on the subject in modern times. The nearest approach to this may be found in the large volume, *Études sur le Cancer,* by Dr. Bougard, published in Brussels in 1882. The author appears to hold a good position in Brussels, and, although his book is written with too evident a bias in favour of one particular course of treatment, and exhibits a lamentable ignorance of the conditions of modern operative surgery (or else a very horrible picture of Belgian surgery), there is no attempt at concealment or secrecy. I have therefore thought it desirable to describe the method which Dr. Bougard employs, the more so because he gives tables of a large number of cases which have been treated according to his method, and details, more or less complete, of the course of many of the cases.

Dr. Bougard's paste consists of—

Wheat flour	60 grammes
Starch	60 „
Arsenic	1 gramme
Cinnabar	5 grammes
Sal-ammoniac	5 „
Corrosive sublimate	0.50 centigr.
Solution of chloride of zinc at 52°	245 grammes

The six first substances are separately ground and reduced to fine powder; they are then mixed in a mortar of glass or china, and the solution of chloride of zinc is slowly poured in while the contents are kept rapidly moved with the pestle, so that no lumps shall be formed.

The soft homogeneous mass which is formed is poured into an earthenware pot with a cover, in which it may be kept for several months without losing its quality.

To destroy the skin, it is necessary to employ Vienna paste or some similar caustic; Bougard uses the Vienna paste. During the action of the paste, which produces in most persons a good deal of pain—perhaps the only pain experienced during the whole of the treatment, certainly the most acute pain—the patient may be kept partly under the influence of an anæsthetic, or may take opium or morphia.

Suppose that a tumour of the size of an egg (a cancerous tumour) has to be destroyed, and there are no complications. The patient is laid in a horizontal position, a little inclined towards the sound side; the portion of skin to be cauterized is exactly defined with a pen and ink, and the Vienna paste, which has just been made into a paste, is rapidly applied within the limit which has been traced. In eight or ten minutes the whole thickness of the skin is cauterized; the caustic is then removed, the surface dried with pads of lint, and any sanguineous or serous oozing is arrested by touching the point from which it takes place with nitrate of silver. Then a layer of the special paste, about 3 millimètres thick, is applied with care not to pass beyond the line of limitation. The paste is kept within the limit by surrounding and covering it with lint, over which is a compress, the whole kept in place by a body bandage provided with braces. The caustic is left on about five hours, is then removed and replaced by a linseed-meal poultice, which is applied fresh two or three times between its first application and the next day. As a rule, the pain subsides under the influence of the poultice; if not, the surface is sprinkled with laudanum, and the patient takes some more soothing (opium or morphia) mixture.

The next morning the eschar is incised all round at a distance of a quarter of an inch or less from the sound skin, and the dead tissue is raised and removed. When the surface has been cleansed, a layer of caustic 7 or 8 millimètres thick is immediately applied and is surrounded as before by a thick layer of lint to protect the surrounding skin. The caustic is left on for six hours, then again replaced by a poultice.

The next day the same manœuvres; the eschar is removed, but not in its entire thickness, for 2 or 3 millimètres of it are left over the whole surface. The reason for leaving this thin layer of eschar is to avoid hæmorrhage and to diminish the pain of the application, nor does the thin layer prevent the thorough action of the caustic. The caustic is applied anew, and, after five or six hours, the poultice.

Again, on the following day, the same measures.

The applications are continued day by day until the tumour has been completely destroyed—a fact which is determined partly by a careful examination of the depth to which the tumour extended before the treatment was commenced, partly by the different character of the eschar. The eschar of a scirrhous tumour is hard and dull white; that of the connective tissue whitish-yellow, in which little masses of fat are scattered, and very much softer. Poultices are now applied continuously until the separation of the eschar, which commonly takes place on the sixth or seventh day, when the surface of the granulating wound is examined with the utmost care to discover whether any of the disease remains behind. If there is the least suspicion that that is the case, the caustic must be re-applied without hesitation, care being taken to protect the surrounding surface of the wound by means of lint pads.

Finally, the opposed surfaces of the healthy wound are brought into apposition, or as nearly so as possible, by drawing them together by means of strips of fine linen, several of which are fastened by collodion on each side, and the free ends are tied in knots. This manœuvre may require to be practised many days in succession, and in those cases in which there has been a considerable destruction of the integument it may be impossible to bring them close together. When they have been brought into apposition, healing by the union of granulations usually occurs.

In cases in which the patient is old, or delicate, or nervous, the applications of the caustic are only made at intervals of two or three days. The frequency with which they should be made, and the quantity of skin and the area of the surrounding tissues which ought to be destroyed, depend largely on the condition of the patient, the character and rapidity of growth of the disease, and on the action which the caustic has upon it. Medullary cancers, for example, are not so easily destroyed by the caustic as the harder forms, and a larger proportion of chloride of zinc will be required. As in all similar matters, the author declares that experience of the method will guide the surgeon as to the best manner of using the paste, and he who is most experienced and skilful will obtain the best results.

3. *Operations for the Removal of the Lymphatic Glands.*—Removal with the knife is often performed at the same time as the removal of the breast; indeed, this is the rule in all cases in which there is enlargement of the glands at the time the affection of the breast first comes under the notice of the surgeon. But it sometimes happens that the glands were not sufficiently large at the time of the amputation to be noticed, and their existence has not been observed until the lapse of several weeks or months after the first operation. In the first case, the incision made for the amputation of the breast is continued upwards into the axilla, the deep fascia of which is divided until the cancerous glands are discovered. It is better to remove them by drawing them out separately, or two or three at a time, with the fingers, even tearing them out from the fat in the midst of which they lie, than to use the knife freely, on account of the proximity of the large vessels and nerves. But the freedom with which the knife may be used depends, of course, largely on the situation of the enlarged glands. If they lie low down in the axilla against the wall of the chest, they may be cut out without fear; if they are high up, great caution must be employed. The sub-scapular artery and other small vessels will probably be wounded, and will need to be ligatured, but there is rarely more severe hæmorrhage than proceeds from such vessels as these. Every part of the axilla is very carefully examined for glands, and every gland which can be discovered is removed, whether it is obviously diseased or not. The search is carried up beneath the pectoral muscles, and it is not an uncommon occurrence to remove glands from around and behind the axillary vessels and the brachial plexus. In some of these operations, especially those in which there are large masses of adherent glands running high up into the axilla, the axillary vein has been torn or wounded, and even the axillary artery has met the like fate. The accident is not necessarily fatal, for a ligature may be placed round either vessel before a large amount of blood is lost. More prudent operators desist from the removal of the adherent mass before the main vessels are injured. In undertaking these operations for the removal of diseased axillary glands, it is always well to bear in mind that the operator is certain

to find that the diseased glands are more numerous and more adherent than they appeared to be before the operation was begun.

After the glands have been removed, the bleeding vessels tied, and the deep wound thoroughly sponged out with a solution of carbolic acid, a drainage-tube is introduced to the bottom of the cavity, and the edges of the skin are brought together in the same manner as the edges of the amputation wound.

Two or three matters ought to be borne in mind in connection with these operations on the axilla. The axilla must be shaved and kept covered, for several hours previous to the operation, with lint soaked in a solution of carbolic acid or some other antiseptic. The incision should be carried along the lower rather than the upper border of the axilla (as recommended by Banks), in order that the wound may be as low down as possible, for the advantage of better drainage. Great care must be taken after the operation to keep the arm close to the side and very quiet for several days. Every precaution which was recommended in the case of the simple amputation of the breast must now be doubled, for the opening of the axilla has added largely to the danger.

One more circumstance must be mentioned in this section. No prolonged search need be made for the lymphatic vessels lying between the breast and the glands. If distinct cords can be felt running up into the axilla or directly to the glands, they should certainly be removed, and with them the fat and connective tissue in which they lie. But if there are not any distinct cords, it is not necessary to search for the lines of lymphatic vessels or to remove a large quantity of the fat and other tissues in order to insure their removal.

I will now refer to the very much more severe measures recommended by Gross (*loc. cit.*) and Banks (*British Medical Journal*, 1882, ii. 1138). These surgeons are in the habit of cutting off the mamma with all the skin which covers it, dissecting off the fascia from the pectoral muscle, searching for out-lying lobules of the gland in the surrounding tissues, carrying the incision into the axilla, whether enlarged glands were previously felt there or not, and clearing out the glands and all easily removable structures. The exact method of performing these operations does not require description, for there is no essential difference between them and the operations which have been described. The extent of the parts removed and the opening of the axilla on all occasions are the only points in which they differ from the operations more commonly performed. Gross does not employ Listerian dressing, and Banks does so only when the operation is performed in the hospital. Both surgeons admit the severity of the procedure, and Banks takes the precaution of drawing together as much as possible of the wound left by the removal of the breast before attacking the axilla, to enable the operator, "if he find he cannot thoroughly clear the axilla, or if he see the patient becoming collapsed, to terminate the operation at once." But both surgeons are impressed with the absolute necessity of very extensive operations if the patient is to be afforded a reasonable chance of complete recovery from the disease. On these questions I shall have much to say presently.

Destruction of the Glands by Means of Caustics.—Here, again, I shall take the liberty of using Dr. Bougard's work, in which he describes his process in its application to the glands in the axilla. The manner of the applications and the use of Vienna paste to destroy the integument are precisely the same as for the removal of the breast. The points to which it is necessary to draw attention are the parts to which the caustics are applied. The skin is destroyed over the diseased glands, allowing a margin beyond the enlargement, particularly up into the axilla; and the "band" which unites the mother-tumour to the mass in the axilla is treated in the same way, taking care to destroy a band of skin over it of at least 2 centimètres in breadth. After the destruction of the mass in the axilla, other separate glands which could not be felt before the operation may be discovered deep in the wound, in the vicinity of the main vessels and nerves. These may be separately destroyed with caustic, or may be removed with instruments.

Operations for recurrence of the disease, either in the breast or in the axilla, are frequently performed with the knife by most surgeons, with caustics when the operator favours this method of treatment. It is not possible to give an accurate description of such operations. They consist in removing or destroying the disease as widely and thoroughly as possible; but the amount of the soft parts removed must necessarily depend on the situation of the disease and its relation to the surrounding structures. When the tumour is recurrent in the breast or in the region of the scar, the operation may include a large portion of the pectoral muscle, and may reach to, and even pass between, the ribs. Operations performed with cutting instruments rarely attack the ribs, not on account of the danger which may be apprehended from injuring the walls of the chest, but because the disease is in most cases so extensive and serious that there is little or no hope of curing or relieving the patient, even by the most extensive operations. Dr. Bougard, on the other hand, declares that he does not hesitate to attack the muscular and bony walls of the chest with his caustics. On this matter I shall speak presently in considering the results of operations.

Results of Operations.—*Mortality of the Operation.*—The operation of removal of the breast has been so frequently performed, especially during the last twenty or thirty years, that it is possible to collect a large number of cases. For the consideration of the actual mortality due to the operation, I will take 605 cases, of which Gross has put together 519, including the cases of Henry, Oldekop, Winiwarter, and 100 of his own. The remaining eighty-six cases are composed of forty-six operated on by Banks and forty in which the operation has been performed by myself. I could, of course, have collected a very much larger number of cases, but the number is quite large enough to allow a fair estimate of the danger of the operation. I shall compare these cases presently with the cases of Bougard, in which the destruction of the disease was effected by means of caustics.

Ninety-six of the 605 patients died from causes which might be referred to the operation more or less directly. I make this modified statement because several of the patients, two or three, died of bronchitis which was not directly produced by the operation, but which might never have occurred, or at least not have occurred in a fatal form, had it not been for the operation. This accident happened to one of my own patients, a lady who was subject to bronchitis, and who was attacked by it, between two and three weeks after the operation, so severely that she died about the twenty-first day. The operation was performed when the weather was cold; she recovered exceedingly well, and at the end of a week was left under the care of her family attendant, for she lived at some distance from my house. The fatal attack of bronchitis was attributed to the nurse exposing her during the dressing and changing, and to the open windows of her room. Banks deplores the death of one of his patients from a similar cause—the folly of a nurse in allowing a window to remain open above the patient's head the whole of a cold night. Of course, one would like to exclude such cases from the list of those fatal from the operation, on the ground that the bronchitis had nothing directly to do with the operation. But I do not think we can take this course, for the chances are that the patient would not have died of the attack of bronchitis (to which she was subject) if she had not been lowered in health and strength by the operation. Taking all the fatal cases, numbering ninety-six, it will be seen that the mortality is nearly one in six, or 15.85 per cent., a mortality which cannot be regarded as small, and which I am sure is much larger than it ought to be. After this bare statement of numbers, it is necessary to examine the mortality rather more closely with a view to discover the principal causes of death, the mortality after different forms of dressing, after major and minor operations, &c.

First, with regard to the causes of death, they were, in the very large majority of cases, such causes as pyæmia, septicæmia, and erysipelas; in fact, diseases which are classed under the general name of blood-poisoning. Some of the patients died, as might be expected, of collapse after the more severe operations, some of gradual exhaustion some days after the operation, and some of pleurisy or pleuro-pneumonia. The relation of this last disease to the operation might be regarded as merely accidental, of the same kind as the bronchitis which has been alluded to, but there are reasons for believing that the relation is more intimate. The inflammation of the pleura and lung is usually of the same side of the chest as that on which the operation has been performed. In some instances it supervenes very quickly on the amputation, and may then perhaps be attributed to the exposure of the wound during the operation, and to consequent cold falling on that side of the chest, especially when a cold spray has been playing for a long time on the open wound. In other cases the pleurisy is associated with erysipelas of the wound or with general blood-poisoning; it may then be due to extension of unhealthy inflammation along the vessels of the wall of the chest to the pleura, so that it may be looked upon as essentially erysipelatous or septic.

In these days of antiseptic surgery, with the mortality from blood-poisoning diminished to a very low ebb, it certainly appears that the admission that the large majority of deaths from amputation of the breast is due to blood-poisoning does not speak very well for the care which is taken in the performance of the amputation or of the manner in which the wounds are dressed. Speaking of the effect which the antiseptic treatment (by which I imagine the Listerian method of dressing wounds is meant) has had on the mortality, Gross says that he is not in the habit of employing it, chiefly apparently because the wound which he makes is generally an open wound, where there is no danger of decomposition of retained secretions and clots of blood. I do not, however, see how this can apply to the deep cavities in the axilla, which are not open wounds. Gross quotes the statistics of Oldekop, which are founded on the operations performed in Esmarch's clinic, and which show that 184 operations were dressed with various dressings, and that sixteen of the patients died; whereas seventy-seven operations were dressed by the "antiseptic principle," with seven deaths. The relative mortality is therefore a little higher in the cases in which the "antiseptic principle" was employed.

Every surgeon who has had the care of cases of amputation of the breast must admit the difficulty of keeping the axillary wound perfectly aseptic, and I do not believe that the Listerian method of dressing will accomplish this result more certainly or more frequently than other less complicated methods. I have arrived at this conclusion, not merely from my own experience of the Listerian dressings applied to wounds of the breast and axilla, but from the account of Professor Lister's breast operations in Mr. Watson Cheyne's *Antiseptic Surgery*. Speaking of the operations performed by Sir Joseph Lister between the years 1871 and 1877, Mr. Cheyne says:—"Thirty-seven excisions of the mamma were performed aseptically, with two deaths, both from infective disease. One of the deaths was from septicæmia occurring after the removal of a very large portion of skin and of the whole contents of the axilla. Everything went on perfectly well till the tenth day, when a mistake was committed in the dressing; putrefaction occurred, and septicæmia commenced. On post-mortem examination no abscesses or infarcts or other marked appearances were found. The other patient died of erysipelas. Among these thirty-seven cases there were twenty-four in which not only the mamma, but also the fat and glands from the axilla were removed" (p. 373). Again, at p. 382 Mr. Cheyne describes Professor Lister's results at King's College Hospital between 1877 and 1880, thus:—"There were sixteen excisions of the mamma and axillary glands, with two deaths. Both operations were very extensive, and both patients died from shock within thirty-six hours." Between 1871 and 1880, therefore, Professor Lister amputated the mamma, with or without removal of the axillary glands, fifty-three times, with four deaths. The mortality is rather less than 8 per cent.; two of the deaths were from shock, two from sepsis.

Comparing these results with those which Sir Joseph Lister has obtained in operations of various kinds on other parts of the body, it must be admitted that they are not at all good. I can even compare favourably with them my own cases of amputation of the breast, in some of which the breast alone was removed, but in the large majority of which the operation embraced amputation of the breast and removal of the axillary glands. I have performed the operation on forty patients, with only two deaths. One of these was due to bronchitis (the case is mentioned in a previous paragraph), the other to tetanus. The patient in this case was a lady from whom I removed the entire breast and the axillary glands. She made an admirable recovery; the wound healed by the first intention at every point, except where a small tube had been inserted deep down in the axilla, and this wound was so nearly healed ten days after the operation that there oozed from it only two or three drops of an almost clear liquid in the course of the day. The temperature had never risen above 100° at any time after the operation, and had fallen to normal on the third day. It seemed impossible to conceive a better recovery, and my patient was allowed to sit up on the eleventh day. On the following day she presented very slight symptoms of tetanus, which rapidly developed into an acute attack, to which she succumbed in four days. Unless the tetanus in this case is attributed to a septic origin—which I do not believe, although I am prepared to admit that some cases of tetanus are due to septic causes—neither of the two deaths in my forty cases were due to wound-poisoning. The absence of any instance of wound-poisoning may, perhaps, be attributed to good fortune; and it may be said that another series of forty cases would probably afford a larger mortality and several instances of sepsis. I would not for a moment venture to deny the justice of this view, for I quite admit the great difficulty of managing an axillary wound so as to prevent decomposition. But so far as the general mortality of breast-operations is concerned, I have every confidence that the relative mortality of another series of operations will not exceed that of the last series—a mortality, namely, of 5 per cent. For that mortality is not mine alone, but has been, as nearly as possible, the general percentage of mortality of our breast-amputations (with and without removal of the axillary glands) at St. Bartholomew's Hospital for the last ten or more years. Knowing that it is not the custom of my colleagues at the hospital to employ the Listerian method of treating mammary wounds, I was curious to see what had been the general percentage of mortality in these operations. Taking the statistical tables of the ten years 1876 to 1885 inclusive, I found that the breast had been removed, either alone or with the axillary glands, in 278 cases, and that 266 patients had recovered, twelve died.

Although I am afraid there is no royal method of dressing wounds of the breast by which sepsis can be avoided with absolute certainty, there cannot be any doubt that septic poisoning may be very largely diminished by scrupulous care and cleanliness during the operation, and by great attention to drainage of the wound, &c., afterwards. To these things, rather than to a particular dressing or method of applying it, we must look in the immediate future for success.

The second question is, how far the extent and kind of operation affect the mortality. The foregoing numbers refer to all operations practised for cancer, from simple amputation of the breast to amputation of the breast and removal of the glands in the axilla, laying bare, cutting away portions of and cauterizing the pectoral muscle, excising a portion of the axillary vein, even cutting and ligaturing the axillary artery, and removing glands from the infra-clavicular region. That the mortality must depend in part on the nature and extent of the operation is only reasonable to suppose; and especially upon whether the axilla is opened or not. I cannot give the exact proportion in the 600 cases I have used in the preceding paragraphs in which the entire breast and glands were removed on the one hand and the breast alone on the other hand; but there are within my reach cases in sufficient numbers to allow of a comparison. In the first place, Henry records thirty deaths in 147 cases, and the analysis of these thirty deaths shows that eight of them followed amputation of the breast, twenty-two were due to more or less extensive removal of the breast and of the glands from the axilla. But these numbers are not so effective as those derived from a collection of cases which I have made from various sources. I have notes of 141 cases in which the breast alone was amputated, and of 170 in which the glands were removed in addition to the amputation. The total mortality attributed to the operations in the 311 cases is fifty-one, and the causes of death are of the same kind as in the cases which have been already used. But, whereas thirty-nine of the deaths are to be ascribed to the operations in which the axilla was opened, only twelve are attributable to the simple amputations of the breast. The mortality due to the larger operation is therefore, as might fairly be expected, much more than twice as great as that due to the smaller operation. Allowing for the errors which are inseparable from the statistical method of dealing with questions of this kind, I believe that this proportion will fairly represent the relative danger of the two operations. But at the same time I think that the mortality of both is much higher than it ought to be.

Let us now turn to the results of the operations by caustics. Dr. Bougard tells us that he has operated on 162 patients for the removal of cancer of the breast, and many of the women were in what he terms the second stage of the disease, that is, the glands in the axilla were affected and required treatment. Of these 162 persons he declares that not one died of the effects of the treatment. I am inclined to believe that operations performed with caustics in the manner described by Dr. Bougard are far less fatal than operations of the same magnitude performed with cutting instruments; but I confess I find it difficult to credit this statement of upwards of 162 operations of greater or less magnitude (some of the patients were subjected to more than one operation, for the disease recurred) without a single fatality. The crust of dead matter which is formed under the influence of the caustic is, I believe, usually aseptic, and certainly does not generally smell offensively, and therefore there is probably less danger of pyæmia and septicæmia, but it is difficult to understand how the patients escape erysipelas, secondary hæmorrhages, death from exhaustion due to long-continued suppuration, and the many accidents to which persons are liable who suffer from open wounds of large size, particularly as many of the patients are advanced in life. That there is nothing in the character of the wound which confers on it an immunity from erysipelas is proved by the statement of Professor Billroth that he employed caustics in five cases of mammary cancer, and one of the five patients died of erysipelas. With the knowledge of this fact, one cannot admire too much the good fortune which has attended Dr. Bougard in his operations on 162 persons.

Cures effected by Operation.—As, in considering the mortality, I availed myself of several different sets of cases, I shall take the same course in the consideration of the cure of cancer of the breast by operation. First, Gross tells us that the results in 519 cases were that forty-seven of the patients were free from any sign of disease for a period of three years or more after the operation. In those cases in which more than one operation was performed, the duration of the cure is reckoned after the last operation. Forty-three other patients were well and free from disease during the period of from a few weeks to three years, but these are not regarded as cured, on account of the comparatively short period which had elapsed since the operation. The number of cures must be reckoned as relative, not to the total number of 519 cases of operation, but to 519 minus 64 cases which were lost sight of after operation (455). The proportion of complete cures is therefore rather more than 10 per cent., in addition to which a small margin may be left for those of the forty-three patients who might reasonably be expected to remain free from the disease at the end of three years.

In order to correct or confirm the statistics of Gross, I have collected a large number of cases of amputation of the breast for cancer, and have tabulated the results. I have already stated them so far as the mortality due to the operation is concerned. The number of patients who survived free from all sign of disease for full three years after the operation was thirty, and the number of patients subjected to operation was 311. But the result was unknown in sixty-nine cases, owing to the patients having been lost sight of, so that the total number of cases is practically reduced from 311 to 242. The proportion of cures is therefore larger than that deduced from Dr. Gross's tables. In addition to these thirty persons, there were other women who were free from all sign of recurrence between two and three years after the operation, and some of these may be expected to remain free from recurrence. Many of the cases which I have collected are from the same sources as those collected by Gross, so that the two sets of cases overlap; but my list contains a great many which are not included in Dr. Gross's work—which are not, indeed, included in any published work, for they are taken from unpublished records. I am therefore confident that we may regard operations for the removal of mammary cancer as successful in effecting a complete cure in rather more than 10 per cent. of all cases treated. I believe that a percentage of 12 to 15 is nearer the truth.

In examining the class of cases in which the operations were attended with success, we have not an equal amount of information to that which I have been able to offer in some of the chapters for which I collected all the cases from the original sources in which they appeared, whether manuscripts or publications. But a great deal of very valuable information is within reach. In the first place, while there can be no doubt that early operation is of the greatest importance in determining a favourable result, it is nevertheless true that many of the most successful cases were those in which the operation was long deferred. In Henry's *Statistische Mittheilungen über den Brustkrebs* the duration of the disease in one of the successful cases was ten years. The tumour was adherent to the integument, but not to the deeper parts, and there was no affection of the lymphatic glands. In Oldekop's "Statistische Zusammenstellung von 250 Fällen von Mamma-Carcinom," in the 24th volume of Langenbeck's *Archives*, the list of patients who had remained well and free from disease for a period of three or more years after the operation contains twenty-one cases in which the duration of the disease to the date of the first operation is stated, and in nine of the twenty-one it was from two to five years. The slow progress of the disease during that period may be estimated by the fact that in six of the nine there was no affection of the lymphatic glands. And in seven of the nine a single operation sufficed for the cure of the patient.

These facts are in accordance with what was stated, in the Introduction, of the vast difference which exists in the relative malignancy of cancers of the same variety occurring in the same part of the body and apparently under precisely similar conditions. The tumours in these cases were undoubtedly tumours of mild or very mild malignancy, and the fortunate results are to be ascribed to this cause, but are not to be used to justify the delay of operations for cancer of the breast. A glance at von Winiwarter's, Henry's, and Oldekop's tables suffices to prove that deferred operations are only successful when the patient happens, happily for herself, to suffer from a very mild form of cancer. And even such cancers, if they are left too long, establish such relations to the surrounding structures or to the lymphatic glands that they become as hopelessly fatal as the most malignant growths.

A study of these same tables will also show that recurrence of the disease *in sitû* and affection of the lymphatic glands are not by any means absolute preventives to a successful issue of operations. Henry's tables certainly do not contain any instances of complete cure where more than a single operation was performed, but Oldekop's twenty-five cases contain no fewer than six in which a second operation was practised, and in one of the six three operations were performed. And all three authors publish many cases in which not only the breast, but the axillary glands were affected, were removed, and the patients were completely cured. That the prognosis is rendered much more grave by recurrence there can be little doubt, and that it is infinitely more grave in every respect when the lymphatic glands are diseased there can be still less doubt. Indeed, I shall presently bring forward such evidence on this point as will conclusively prove how great a difference there is between the cases in which the glands are free and those in which they are involved.

In connection with these points there arise the very important questions of the value or necessity of the very extensive operations recommended by Gross and Banks. Their practice, of which an outline has been given in the Methods of Operation, consists in the removal of the whole of the mammary gland, of the whole of the skin covering it, of the fascia beneath it, of as much of the pectoral muscle as may be deemed advisable, of the soft tissues connecting the breast with the axilla, and of the lymphatic glands in the axilla, whether there is any obvious disease of them or not. This operation, if an attempt is to be made to cure, and not merely to palliate, the disease, is to be practised in all cases of cancer of the breast without respect to age, size, or character of the disease, rapidity of growth, and condition of the neighbouring structures. Both Gross and Banks ascribe this vigorous treatment to the influence of the teachings of the late Charles Moore in what Gross calls "a remarkable paper" entitled "The Influence of Inadequate Operations upon the Theory of Cancer" (*Med.-Chir. Trans.* l. 245), and both surgeons have pushed this teaching so far that it has already gained many adherents, although I believe rather among foreign than among English surgeons. Indeed, I was surprised to find how strong an opinion was expressed against it by some of the English operating surgeons at a recent meeting of the Harveian Society in the discussion of a paper by Mr. Banks. As I entirely disapprove of this wholesale method of treating cancers of the breast, and believe it to be unscientific and needlessly cruel to many women, I shall venture to criticize it as thoroughly as I can do on the evidence which is before me. I have not at the present moment any detailed account of the cases which have been treated by Gross, and shall therefore take the tables published by Banks for the basis of my remarks. And, as I have not by me his last series of cases, I shall take that which is published in *Some Results of Operative Treatment of Cancer of the Breast* (Edinburgh, 1882). I think there can be no objection to this course, for there is no essential difference between the later and the earlier results, so far as I was able to judge at the Harveian Society. The mortality is as nearly as possible the same, and the causes of death are of the same kind, while the proportion of cured cases is very similar, if not identical.

Before I enter on the discussion of this question, let me say that no personal feeling exists between myself and those who hold the doctrine of extensive operation, and that, if I speak at any time warmly on the points under discussion, it is because the subject is one in which I take the warmest interest, and on which I hold very decided opinions. I entertain a great respect for both Dr. Gross and Mr. Banks, and only mention their names as the distinguished leaders of a school of surgery from which I venture to disagree.

Leaving the minor points which are raised in Mr. Banks's paper, such as the question of whether surgeons deliberately persuade their patients, and almost persuade themselves, that they remove cancers which they have not really removed, we find that it contains two major propositions. They are:—(1) That in every case of cancer of the breast (with the exception of those in which a palliative operation is performed) the operation should comprise removal of the whole mamma, of the skin covering it, and of the fascia over the pectoral muscle; (2) That the axilla should be opened and the contents cleared out, whether enlargement of the glands can be detected or not. These propositions must be kept quite separate, for they are wholly distinct, and are only very indirectly connected with each other.

In considering the first proposition, it must be clearly understood that the operation recommended by Banks is not such an operation as that which is frequently practised in London and provincial hospitals, but is much more sweeping, for it includes the whole of the skin over the breast, and not merely over the tumour. In fact, the breast is, so to speak, lopped off as if the operation had been performed with a sword or a carving-knife. Now, I quite admit that, if the entire breast is to be removed in every instance of cancer, the operation should be of this sweeping character. But I am strongly of opinion that the practice of removing the whole of the breast in every case is theoretically and practically wrong.

The practice of removing the whole breast has been so long in existence, and has been so universal, that it has received a stamp of orthodoxy. It seems a heresy to attack it. We have all been brought up in it, and have learned to regard it as an essential part of the surgical treatment of cancer of the breast. No hospital surgeon dreams of explaining to his class why he removes the whole breast instead of limiting his operation to a thorough removal of the disease. But, were he to adopt the latter practice, he would deem it necessary to explain the grounds on which he had departed from the customary operation. I do not know when the complete removal of the mamma became a necessity, for I have not been able to lay my hand on the earliest proposals for it. Nor do I know the exact grounds on which it was in the first instance recommended. But I have no doubt it was the result of *a priori* reasoning, and was founded on the impression that the whole of the mammary gland is in an unhealthy state, and so predisposed to cancer that the disease will almost assuredly occur in any portion of it which is left behind. On whatever evidence this impression was based, I have no hesitation in saying that it is only very partially true, and is certainly not so largely or so frequently true that it ought to be allowed to exercise a considerable influence on the nature and extent of operations which are performed for cancer. Probably a long time and much false reasoning were required to induce the acceptance of the doctrine of the necessity of the removal of the mamma for cancers of small size limited to a part of it; and I am afraid a still longer time and much good reasoning will be required to convince surgeons that the practice is radically wrong.

I have myself been so long in the habit of blindly following the usual teaching in reference to the removal of the breast, and have rather leaned towards more than less extensive operations, that it was only during the writing of this book that I became impressed with the necessity of a reconsideration of the subject. One of the reasons which led to this conclusion was the unfortunate influence which the theory of the complete removal of organs had exercised on the surgery of cancer of the uterus. And I could not but see, on the other hand, what an excellent influence was exercised by careful study of the course of the disease (by Ruge and Veit) and of the results of modified operations for cancer of the vaginal portion. Unfortunately, there are at present no records of such complete (yet partial) operations for cancer of the breast as have for a long time past been practised for cancer of the vaginal portion of the uterus, and no carefully prepared accounts of the course which cancer of the breast pursues in relation to the breast itself. Of course we all know well how the primary disease involves the skin and the pectoral fascia, how it spreads to the adjacent portions of the gland, and how secondary growths are produced. But there is practically only the scantiest evidence to show in what direction cancers of the different segments of the mamma naturally tend to spread, or whether they have an equal tendency to enlarge in all directions. I am speaking here rather of the ordinary tuberous form of cancer, in reference to which the question of partial removal can alone be raised.

So far as I have seen, local recurrence takes place in, or in the immediate neighbourhood of, the scar of the last operation, not at a distance from it. Certainly, in the vast majority of instances there is nothing to lead one to believe that the new growth arises in the out-lying lobules of the mammary gland, or in any remains of the parenchyma of the gland. During the time that I was registrar at St. Bartholomew's Hospital I took notes of many cases in which there was recurrence of cancer of the breast, and in nearly every instance in which the recurrence was in the mammary region it was under or close to the scar. In some instances, in addition to the one or more nodules there, tubers and plaques of cancer were present in the integument for some distance around the scar. Within the last week I have seen one of these cases. The operation had been performed at King's College Hospital. A year later, the first signs of recurrence had been observed, and at the time I saw her there were, in addition to several nodules of small size attached to the scar, many plaques of cancer in the integument in and beyond the mammary region.

Von Winiwarter expressly states the experience of Billroth's Klinik in respect to this question. He says (p. 95) the form of recurrence was exclusively that of small nodules, usually from three to six in number, which had their seat, not in the possible remains of the glandular parenchyma ("in den etwa zurückgelassenen Resten des Drüsenparenchyms"), but partly in the scar tissue itself, partly in the subcutaneous connective tissue in the neighbourhood. In one case the entire remains of the mammary gland were infiltrated with carcinoma (after partial extirpation).

As examples of the manner and form of recurrence, I will give three cases which have of late years come under my notice, and of which I have the notes here by me. Some time ago I admitted a woman into the hospital who had been operated on a few months previously in one of the Northern towns for the removal of a tumour of the breast. Apparently, the tumour had not been suspected to be cancerous, and, as it was of small size and situated quite at the upper part of the breast, the operation was limited to its removal, and almost the whole of the breast was left behind. There was a scar at the upper part of the mammary region, and beneath and around the scar there was recurrent growth. But the rest of the mammary region was perfectly healthy, and there was no sign of tumour in any other part of the gland.

In November of 1884 a lady was sent by her medical attendant to consult me with regard to a small tumour about 2 inches outside and a little above the right nipple. It was about the size of a marble, and was so circumscribed and movable that I did not think it was a cancer, and therefore advised that it should be dissected out. This was done, and the growth was sent to me for examination. It proved to be one of those rare tumours, an encapsuled carcinoma, but the further history of the case clearly showed that the capsule had no effect in preventing the recurrence of the disease, for in September of the following year she came to me again with a lump, the size of a bantam's egg, beneath and adherent to the scar. The rest of the breast was perfectly healthy, and there was no sign of tumour in any part of it.

I could adduce many similar instances to these two, but will content myself with relating one more case, on account of the success which attended a partial operation. In August 1874, at the request of a member of our profession, I removed from the breast of his sister a small carcinoma about the size of a chestnut. It was seated in the outer part of the breast towards the axilla. This might have been a sufficient reason for a small operation, but the chief reason which made us both unwilling to subject her to the operation of complete removal of the breast was that she was prematurely old, and, although only sixty years of age, looked more than seventy. In April 1877, nearly two years and three-quarters later, I removed a recurrent growth which had been noticed about a year and a quarter. It was situated just outside the scar towards the axilla, and was about the size of an almond-nut. The breast was perfectly healthy, and there was no sign of new growth to the inner side of the scar. Again, in April 1879, two years after the second operation, I removed an even smaller growth, from just below the outer cornu of the scar, where it lay beneath the pectoral muscle almost in the axilla, but there was no enlargement of the lymphatic glands. I have not seen Miss B. since, but heard from her brother a few days ago to the following effect :—" With regard to my sister, from whom you removed a small tumour in April 1879, I may tell you that a similar one formed in about the same place a few years afterwards, and was successfully removed by your successor at the West London Hospital about three and a half years ago. She is now in the enjoyment of good health, and has had no return of the enemy."

In these three cases the recurrence of the disease was just where it would have been had the removal of the entire breast been performed, and was neither quicker nor slower than is usual in cases of recurrence. To say that the recurrence in two of them was very early is not an argument against removal of the tumour instead of the entire breast, for in both these cases the tumour was not thought to be cancerous, and the operation was wholly inadequate, for there was no removal of the surrounding tissues, except to a very limited extent, just such as might have been made in the removal of an innocent growth which was not easily separable from them. On the other hand, could Miss B. (case 3) have derived any greater advantage from the removal of the entire breast than she did from the removal of the tumours as they occurred? The disease never recurred on the side nearest to the nipple, the remains of the mammary gland have never been attacked by the cancer, and the operations have been finally crowned with success. By operations of small extent, which have never laid this lady up for more than a few days at a time, which have never been attended with serious risk to life, but which were, nevertheless, directed to the very complete removal of the actually existing disease, she has been as completely freed from her cancer as she could have been by the most extensive and dangerous operation.

Another kind of evidence which bears on this question is that which may be learned from the practice of those who employ caustics for the cure of cancer of the breast. I have already stated my opinion that their results are not inferior to our own. I shall have occasion presently to admit that those exhibited by Dr. Bougard are better than any which have hitherto been attributed to operations with the knife. There can be little doubt that this circumstance is largely due to the careful selection of cases which has been made, and also to the fact that when caustics are employed for the destruction of a cancer of the breast, they are applied directly to the disease, the skin covering it, the parts which lie beneath it, and the surrounding tissues, and no attempt is made to destroy the entire breast unless the tumour happens to lie in the middle of the gland. The destruction of the whole of the glandular structure is practically an accident, for the ablest and most successful caustic-doctors direct their attention solely to the destruction of the tumour and its surroundings, attacking the latter equally in every direction without caring what may be their structure.

In his remarks at the meeting of the Harveian Society to which I have referred, Mr. Banks drew attention particularly to one case, in which he believed, or was sure, that he had neglected to remove a very small portion of the mammary gland. Ten years after the operation, this part became the seat of a renewed outbreak of cancer. I say "renewed outbreak," because I cannot regard it as a recurrence in the ordinary sense of the word. The patient was attacked by it just in the same manner as she was attacked by the cancer which was removed. Mr. Banks considers that this case affords an argument for the entire removal of the breast. Indeed, he regretted that he had not removed every fragment of the parenchyma of the gland from this woman, and so rendered it impossible for her to have been attacked again by cancer of the same region. I admit the correctness of the assumption; but quite as good a reason might have been given for removal of the other breast. The two breasts are not infrequently affected either simultaneously or after an interval; and the relation of the disease in the two breasts is precisely similar to that between the two outbreaks of the disease in the case mentioned by Mr. Banks. Just as good reason could, I am sure, be given for the removal of both breasts in every case of cancer (of one of them) as for the removal of the entire mammary gland in every instance.

The manner in which many cancers of the breast commence seem peculiarly to encourage operations limited to the removal of the disease and the saving of most of the breast; for while some of them are diffused and very widely extended, many of them are at first of small size, limited to a part of the breast, often situated towards the margin of the gland. And the reasons for not removing the entire breast appear to be particularly strong.

In the first place, the operation is more severe (when it includes, as it always ought to do, a very free removal of the tumour, the skin which covers it, and the surrounding tissues) than that for the removal of the tumour, and the mortality is likely to be greater.

In the second place, the patient is subjected to a mutilation which cannot fail to distress her. It is easy to say, and to comfort oneself with the belief, that to a woman of forty years and upwards the loss of a breast is a matter of no consequence, and that, considering the advantages she is to gain, this slight annoyance ought to be treated with indifference. But I believe it affects women much more than we, or even than they perhaps, are inclined to admit, and is not improbably one among the several causes which lead them to conceal the presence of a tumour of the breast until long after the period at which it may hopefully be removed.

And, last, the large operation which removal of the entire breast entails, and the orthodox elliptical incision which must include the nipple and areola, are certainly not without their prejudicial effect on the removal of the actual disease and its surroundings. I have again and again seen operators remove without hesitation the entire breast, in the accepted fashion, for a comparatively small cancer, and yet hesitate to remove a wide area of skin over the tumour and to cut widely and deeply around it, on account of the increase of danger which they feared from so extensive an operation and the uncertainty whether the edges of the skin could be brought together after the removal. The removal of the cancer has been imperfectly performed, on account of the necessity of operating in accordance with precept.

In reply to all the arguments I have brought forward, Mr. Banks has at his command a very strong answer, namely, his results. I quite admit, and with great pleasure admit, that, so far as later results are concerned, they are the best I have ever seen from operations performed with the knife. Of the forty-six patients on whom he had operated previous to 1882, seven were well and free from disease full three years after the operation, and eight were well from one to three years. These results will appear still more happy when it is observed that one patient was lost sight of after she had recovered from the operation, and nine had been operated on during the year before the tables were made up. The superiority of these statistics may be accounted for, not by the fact that the entire breast was removed in every instance, but because Mr. Banks is in the habit of sweeping away the disease itself and the surrounding textures in a fashion at which most operators would be horrified. Of this part of his proceeding I entirely approve, and feel quite sure that, if his operations are in future limited to the thorough (as he understands "thorough") removal of the disease, he will achieve as great success with a far smaller mortality.

The second proposition contained in Banks's paper is that the axilla should be opened and the contents cleared out, whether enlargement of the glands can be detected or not.

At the present time, the usual custom is to open and clear out the contents of the axilla in every instance in which the glands are obviously enlarged and there appears to be a reasonable prospect of being able completely to remove them. And where there is fulness which does not amount to actual proof of enlargement of the glands, many surgeons (among whom I number myself) do not hesitate to open and examine the axilla. But that is a very different thing from opening the axilla in every case as a necessary accompaniment of removal of the breast. In order to justify such a proceeding, there should be clear proof that, in the very large majority of cases in which the axilla is not opened when it has appeared to be quite free from disease, the glands have become cancerous within a short period of the operation. And those cases must not be admitted in evidence in which the affection of the glands is associated with recurrence of the tumour in the breast; the glandular affection may, in them, have directly depended on the local recurrence, and need not have been present when the primary tumour was removed. I know of no such evidence as this. Neither Banks nor Gross, so far as I am aware, has offered any. Mr. Banks does not even give his readers any information of the character of most of the cases on which he operated, and there are no means of discovering the proportion of patients in his tables whose glands were apparently sound at the time of the operation and yet were removed. Curiously enough, however, he has himself furnished excellent proof that the removal of the axillary glands is by no means a necessity. Among his forty-six cases are five in which the breast alone was removed. One of the patients was quite well three years and four months after the operation; one died at the end of two years (without any reappearance of the disease) of some unknown cause; one died at the end of eighteen months of paralysis, and in her there was no recurrence of the disease; one (suffering from a rapidly growing sarcoma) died shortly of recurrence *in sitû;* and one died of affection of the axillary glands, apparently without recurrence in the breast. The results procured in these five cases are very decidedly better than those of the complete tables. There was not one death from the operation; one patient was completely cured; two were so far relieved that there was no recurrence in the breast or appearance of cancer in any part of the body at the time of death, which occurred eighteen months and more than two years respectively after the operation; two died, one of recurrence *in sitû*, the other of affection of the axillary glands. From the tone of Mr. Banks's paper at the Harveian Society this year, I imagine that he would at the present time deem it right to have opened the axilla in every one of these five patients, on the assumption that, by doing so, he might have saved the one woman from affection of the axillary glands. Even if this assumption be correct—and there is no proof that it is so—five women would have been subjected to a much more severe operation than their disease called for, in order to procure a hypothetical benefit for one.

In order to see how far the opening and searching the axilla in every instance can be regarded as a necessity, I have analysed the 311 cases of which I have already spoken (p. 373). Some of them are from private and hospital note-books; some of them from the tables of Henry, Oldekop, von Winiwarter, Fischer, and other published papers. In 141 of these the breast alone was removed. In 170 the operation embraced amputation of the breast and the removal of the glands in the axilla.

The results of the first are as follow:—Twelve died of the operation. Forty-three were lost sight of after their recovery. Forty-eight were dead, or dying, or had been quite recently treated for recurrence of the disease *in sitû*. Three were dead or dying of affection of the axillary glands without local recurrence. Three appear to have died of dissemination of the disease without local recurrence. Three died of other causes than cancer, one of the three more than four years after the operation. And twenty-seven were alive and well at various periods after the operation, but only eighteen of them had passed the three-years' limit. If to these eighteen is added the case of the patient who died of another disease long after the operation, there are nineteen cases of what we term complete cures due to operation. And these must be compared, not with the total number of 141, but with a total of ninety-eight procured by deducting the forty-three cases of patients lost sight of after they had recovered from operation.

The results of the 170 larger operations were :—Thirty-nine died of the operation. Sixty-two died of recurrence of the disease, or of general carcinomatous disease. Seventeen were alive with recurrence. One died of apoplexy more than three years after the operation, without any sign of cancer, and may therefore be claimed to have been cured. Twenty-six were lost sight of soon after their recovery. And twenty-five were known to be alive and well at various periods after the operation ; but the period which had elapsed was under a year in ten of these cases, and was over three years only in ten of them. Add to these ten the patient who died of apoplexy, and deduct from the grand total of 170 the twenty-six who were lost sight of, there will remain eleven instances of cure in a total of 144 cases.

The number of deaths in both series is, of course, much larger than an equal number of mammary operations of equal severity would afford at the present time, but it does not follow that the relative numbers in the two series would be materially altered. Setting aside this question, two facts stand clearly out. First, the cases in which the breast alone was amputated afforded by far the largest proportion (more than two to one) of cures. Second, the proportion of cases in which the disease appeared in the axilla without recurring in or near the scar was singularly small, scarcely more than 3 per cent.

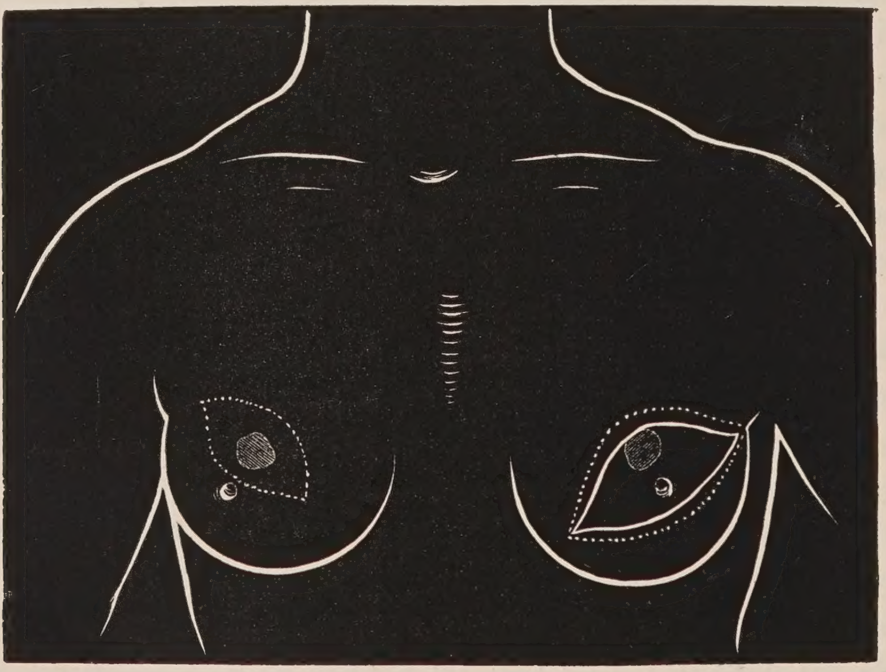
It may be said that, if the axilla had been thoroughly cleared of its glands in the whole of these cases, these four patients would have been spared the glandular disease which caused their death. For the sake of argument, I will admit this assumption, and will then ask whether the saving of these four persons would have been sufficient to justify the infliction of a very extensive and severe operation, wholly out of proportion to the extent of the disease, on more than 130 women.

And, if I decline to admit that these women would have been saved by the larger operation—and I have a perfect right to reject the assumption, for at present it does not rest on proof—there is positively no benefit which can be shown as a justification of the injury which would have been inflicted on a large number of women by the performance of an operation of so serious a character.

The reason why the lesser operation was performed in the successful cases is as clear as the fact of their success, namely, that no affection of the glands was discovered. And the reason why the glands were not affected in many of them is, to my mind, equally clear. Some of them were removed at an early period of the disease, and others of them, by no means a small proportion, were cancers of less than usual malignancy. The long duration of the disease in certain of the successful cases in which there was no affection of the glands is a proof of this. The patients were fortunate in being the bearers of these less malignant tumours, and to subject them to a large and very serious operation, as if they had been suffering from a far more extensive and dangerous disease, would have been a surgical blunder.

My own desire is, both with regard to the primary tumour of the breast and to the glands in the axilla, to see free and thoroughly adequate operations performed, but directed to the situation and extent of the disease, not to theoretical considerations respecting it.

For the treatment of the primary disease, let the tumour be removed just as in any other part of the body, but much more freely than in most other parts, with all the skin covering it, and for some distance around it, with a wide area of the surrounding glandular, fatty, and other tissues, with the fascia and, if needful, a portion of the muscle beneath it.



On the right-hand breast of the figure I have marked the lines of incision suitable to the removal of a tuberous cancer in a large breast. On the left-hand breast of the figure I have marked, by a continuous line, the orthodox incision for the removal of such a tumour when the operation is directed to amputation of the breast together with an elliptical portion of integument. And, on the same breast, by a dotted line, such an incision as might be practised in the larger operation of Banks and Gross. I am not sure that I have represented their operation as sweeping as it really is; but, whether that be so or not, the diagram will plainly show the unnecessary sacrifice of integument and mammary tissues on the lower side, while the upper incision is either close to the disease or only as far beyond it as in the right-hand breast.

So far as the removal of the glands is concerned, by all means let them be removed when they can be felt enlarged, and appear to be within reach of removal. And, in cases in which there is a doubtful fulness which is not apparent on the other side, let the axilla be opened and examined. But let no theoretical considerations lead us further than this, and on no account let the axilla be opened in search of diseased glands of the existence of which there is not the least outward and palpable sign.

Let us now examine the results achieved by Dr. Bougard with his caustics, and compare them with those which have been recorded for the knife. Just as the mortality is singularly small, the proportion of "cured" cases is singularly large, for Dr. Bougard claims to have cured no fewer than sixty-two of the 162 patients on whom he operated, a period of at least three years having been safely passed since the destruction of the disease. The result is so astonishing that we are compelled to look closely into the statistics to discover, if possible, to what happy fortune Dr. Bougard owes it. In the first place, then, it appears that the disease was in fifty-eight of the sixty-two cured patients, limited to the breast, and the operation was on the breast alone. Only in four instances was the "second period" of Bougard reached—that period, namely, in which the tumour becomes adherent to the skin, or to the muscle, or the aponeurosis over the muscle, and the axillary glands are enlarged. Only three or, at the most, four of the patients were suffering from affection of the lymphatic glands. Not only was there no affection of the glands in the successful cases, but the tumours, in most of them, were not adherent to the skin or to the parts beneath. Yet, from the account of the cases, all the tumours appear to have been instances of true carcinoma except one, in which the disease is distinctly stated to have been cysto-sarcoma. And in two instances both breasts were simultaneously the seat of cancer.

When I first looked through Dr. Bougard's work and saw how large a number of patients he claimed to have completely cured by his method, and without a single death, I confess I was disposed to regard his statements as unworthy of credence; for I could see no reason why the destruction of a tumour by caustics, of whatever kind, should afford so much better results than the free removal with the knife. This impression was strengthened by the perusal of a few pages, in which the author shows himself absolutely ignorant of modern surgery. The further I read the more convinced I became that preference for a particular method of treatment had made Dr. Bougard as partial as the most inveterate cancer-curer could be. The description which he gives of the horrible sufferings and distress of women after amputation of the breast, and the manner in which he compares the caustic method with the knife, claiming for the former not merely greater safety and certainty of cure, but greater precision, quicker healing, less or not more pain during the treatment, throw the gravest suspicion on the character of his work. Every surgeon who is in the habit of removing the breast knows perfectly well that in a large number of cases, especially those in which the axilla has not been opened, the wound heals by the first intention, and that the patient suffers absolutely nothing except the stiffness of the first few hours; and that, in cases in which the healing is not so rapid, there is usually little or no actual pain. Even when the axilla has been opened, the greater part of the wound usually heals by the first intention, and the axillary wound itself is not a source of severe or even of moderate pain. The surgery of the present day can certainly claim to have marvellously lessened the pain following operations. Dr. Bougard seems to be quite ignorant of this, and offers such a picture of the condition of a patient after operation with the knife as might well serve to deter the most determined woman from submitting to amputation of the breast. I am not in a position to speak authoritatively on this matter so far as Belgian surgery is concerned; but there is no reason to suppose that it is far inferior to English, French, and German surgery. If this be so, Dr. Bougard's description is precisely such a caricature as cancer-quacks and cancer-curers are often pleased to draw. Among the curious delusions under which he labours, not the least interesting are those in which he assumes that surgeons generally are disposed to defer amputation to a late period of the disease, and that a large number of surgeons have ceased, or well-nigh ceased, to operate for cancer of the breast, on account of the ill-success which has attended operations with the knife.

But a closer acquaintance with the book led to the opinion that the statements are genuine, and that the results are as truthfully related as the knowledge and partiality of the author permit them to be. And a careful study of the histories of the individual cases led me to believe that Dr. Bougard's success has been largely due to a much more rigid selection of cases for treatment than most operating surgeons are in the habit of practising.

Of course, the diagnosis is not so certain of tumours which are destroyed by caustic as of those which are removed with cutting instruments and submitted to examination, and it may be urged that some of the cured cases were not cases of cancer. The objection cannot, I think, be fairly made against a large proportion of the cases, for it is plain from the descriptions that there was a cancerous tumour present in the breast, and the recurrence which took place in some of them afforded proof of the malignancy of the disease. But, allowing for the errors which are inseparable from the mode of dealing with the disease, Dr. Bougard's percentage of successes would still be very large, and I can explain it in no other way than this. Of the care with which the cases are selected for operation, the facts which have been already stated regarding the character of nearly all the successful cases speak. And the manner in which he talks of the hopelessness of operations practised in cases in which there is affection of the glands (at p. 742) leads to the same conclusion. A study of his unsuccessful cases confirms this view. He states that there was enlargement of the glands in many of them, but it is quite certain, from a perusal of the short note which is given of some of them, that very few of the tumours were associated with glandular affection. They were, indeed, in what Dr. Bougard terms the "second stage" of the disease; but that does not necessarily imply that the glands were enlarged, but merely that the tumour had become adherent either to the integuments or to the muscle or fascia beneath.

I am very glad to have studied Dr. Bougard's book with so much care, for several valuable lessons may be learned from it. In the first place, I think there can be little doubt that the destruction of a cancerous mammary tumour may be conducted by means of caustics efficiently and safely, provided the disease is limited to the breast, and that this method should be more often applied than it is at present in the treatment of persons who are obviously not good subjects for a surgical operation, the very old and feeble, and those who are the subjects of organic disease or well-marked degenerations. Many of these persons will bear with very little danger and without murmuring the pain of repeated applications of caustic. They are spared the anxiety and distress of preparation for a surgical operation, as well as the shock and loss of blood directly due to it. The whole process will probably occupy a longer time than the process of removal with the knife, but the wound will almost always heal, unless it is very extensive, and the length of time occupied in the healing is of comparatively small moment compared with the greater safety which the slower method insures. In the cases of younger and healthy persons, I cannot see any advantage to be derived from the use of caustics, provided the removal is as thoroughly made as it ought to be; for the knife can perform the removal more quickly, more dexterously, more appropriately; the wound heals far more quickly, and there is in most instances an entire absence of pain.

A second lesson is the very great advantage of a careful selection of cases for operation. If Dr. Bougard's work had been written for the purpose of showing what can be done by this means, I venture to think that far more benefit would have been conferred both on medicine and on the sufferers from cancer than is ever likely to come from the book in its present form. In refusing to operate in many instances in which an operation would have been practised by most hospital surgeons, it may be said that he has been more careful of his own reputation than of his duty as a surgeon; but I am not inclined to take this view. I have already alluded to this subject in the Introduction (p. 21), and will merely repeat that I believe that the interests of surgery and of our patients are really the same, and that a greater service would in the end be afforded to cancerous persons by far stricter adherence to the principles of surgery than by the occasional success which attends an operation which has been performed in obedience to a sentiment of pity for the patient. The feeling of pity and a desire to do something desperate against a desperate condition lead us too often to attempt the impossible. This feeling is in part no doubt the cause of the rash and useless surgery which has been practised of late years in the treatment of cancers of some parts of the body; and I am sure that the credit of surgery is likely to suffer in consequence.

The advantages of early operations and the total absence of necessity of opening the axilla in every case of mammary cancer are strikingly illustrated by Dr. Bougard's cases, which may be studied by operators with benefit on this account alone.

Are persons who are not cured, benefited by operation? To this question, again, the answer must be strongly in the affirmative. Of course it can not for a moment be maintained that every woman is the better for an unsuccessful attempt to cure her of a cancer of the breast, for in some cases the disease appears to run a more rapid course after recurrence than before the operation. But it may safely be affirmed that a large number of women are distinctly the better for an operation. I believe that this is the opinion of most operating surgeons, but Mr. Banks, whose paper has already been quoted, is of the contrary opinion. He speaks as strongly on this point as on the necessity of opening the axilla:—"On the contrary, the excitement that is set up by the operation makes everything that is left behind of a malignant character grow with double and treble speed, and I am even inclined to think that the deaths after re-appearances are more painful than those where the cancer has never been touched. If a surgeon do not see his way to a clean sweep, I can only implore him to let things alone, for in few diseases does meddlesome interference work more mischief than in this. It is but right that, while pleading the advantages of early and free operation, one should also admit that, if it fail thoroughly to cure, it does not improve the patient, but makes her most decidedly worse." Mr. Banks's own cases afford so excellent an answer to this statement that it is unnecessary to look further in order to disprove it. He admits the general proposition that a patient cannot be reckoned as cured until three years have elapsed since the operation. Of such cases his tables exhibit seven out of the total number of forty-six. But, in addition to these seven, there are eight patients alive and well from one to three years after the operation, and three patients who died after eighteen months to two years without any recurrence in the breast or the axilla. One of these patients died of liver disease which was not improbably cancerous, but there is no certain evidence of this. Indeed, all three patients may have died of cancer, for there is no proof of the nature of the disease which caused death in any of the three, but there was no recurrence in the breast or the axilla. Now, not one of these eleven patients can be claimed, according to the three-years' limit, to have been cured by the operation. Yet they were all free from appearance of cancerous disease either at the time of death or at the time of the last report, from one to three years after the operation. Mr. Banks says that operation, if it does not cure, does not improve the patient. He therefore stands in the very singular position of having a list of women whose breasts he has removed from one to three years ago, who are not cured, who are not suffering from cancer, and whom he will not admit that he has relieved.

The cases in which benefit has followed amputation of the breast and yet the patient has not been cured of the disease are of the following kind :—Those cases in which from six months to two or three years elapse between the operation and the recurrence of the tumour; cases in which there is no recurrence in or near the scar of the operation, and the patient dies of disease of some internal organ, such as the liver, the brain, and spinal cord; cases in which the patient is relieved from the presence of a tumour which is actually ulcerated or threatens speedily to ulcerate. Examples of all these different conditions may without difficulty be found in the practice of every operating surgeon and in every surgical work which is furnished with accounts of cases of operation for cancer of the breast.

Operations for Recurrent Disease.—It has been mentioned, in speaking of treatment by the knife and by caustics, that second and third operations were performed in many of the cases, sometimes for the removal of recurrence of the disease in the mammary region, sometimes for recurrence in the axilla. Although some of these operations were followed by permanent relief, this has been the exception to the rule. Nor will this appear strange when the unfavourable nature of the cases is taken into account. The mere circumstance that the disease recurs after a well-planned and well-executed operation for its removal is in itself a proof of greater malignancy. And the recurrent disease is seldom so limited in extent and so well defined and free from the surrounding tissues as the primary tumour. It is therefore far more difficult to remove satisfactorily.

Results of Operations for Sarcoma.—The material within our reach for estimating the results of operations for sarcoma is singularly small compared with that which we were able to use with regard to carcinoma. There do not appear to be any larger or more complete statistics than those which Dr. Gross has published in his work on *Tumors of the Mammary Gland*, and the total number of patients who were treated and observed after the operation for a sufficiently long period is only twenty-six. Of these, ten suffered from round-celled, sixteen from spindle-celled sarcomas. I believe that a much larger number of cases of what are practically sarcomas might be collected if it were not deemed necessary to divide them into round- and spindle-celled tumours; for the sarcomatous tumours of the breast are rarely such typical examples of sarcoma as sarcomatous tumours of the testis, bones, and other parts of the body. They are composed of various kinds of connective tissue, fibrous, mucous, mixed with round and spindle cells, and most of them contain a larger or less quantity of glandular tissue. It is therefore uncertain whether they are truly sarcomatous or whether they are practically fibrous or mucous tumours. Consequently, comparatively few cases of sarcoma or mixed connective-tissue tumour of the breast are published. Those cases of pure sarcoma which have been published exhibit a degree of malignancy which is not at all inferior to that of the most active carcinomas, not only in their extreme tendency to recur, but in the frequency with which they affect internal organs or distant parts of the body. But I believe the impression which is conveyed in the few cases which have been published where the course of the disease has been observed over a lengthened period is not a thoroughly true impression. The reason of the publication of many of these cases has been the number of times the disease has recurred, or the rapidity and violence with which it has attacked distant parts of the body.

Such as they are, the results are as follow:—The mortality of the operation need not again be taken into account; the mere removal of a mammary tumour is very rarely fatal, and the mortality following amputation of the breast is not likely to differ in the smallest degree from that which follows amputation for carcinoma. Of course, it is scarcely ever necessary to open the axilla in cases of sarcoma, on account of the very rare occurrence of affection of the glands. The rarity of its occurrence must not, however, lead to the belief that glandular affection is impossible. I have, myself, removed within the last few weeks a very large tumour from the breast of a young woman, which proved to be a round-celled sarcoma, and, with the primary tumour, a number of glands from the axilla, all of which bear the characters of the tumour of the breast. Dr. Gross tells us that of the ten patients with round-celled sarcomas whose histories are complete, one was alive and well at the end of ten months, and another died, without any sign of recurrence of the sarcoma, at the end of two years and a half; strange to say, the cause of her death was carcinoma of the opposite breast. All the other eight patients suffered from recurrence. The recurrence took place within six months in five of the eight; four died with or without secondary disease; four were alive with recurrent disease, or after the removal on two or more occasions of recurrent tumours.

Of the sixteen patients with spindle-celled tumours, four were alive and well after periods of from six to twenty-six months, and a fifth was alive with "cancerous deposit" in the axillary glands five years after the removal of the breast; five of the patients were alive with, or after the removal of, recurrent tumours. One of these must be regarded as cured, for after twenty-two operations for the removal of fifty-one recurrent tumours in the course of four years, she was perfectly well ten years after the last operation. Six patients died, four of whom suffered from recurrence in the breast, either with or without secondary tumours, and two died of secondary disease without the recurrence of the disease in the breast.

The account of these cases shows how obstinate the disease, whether round- or spindle-celled, may be. In several of the instances the recurrent tumours were removed on several or many occasions. The result of twenty-two operations, in which the tumours were removed by Dr. Gross's father, also shows that hope may be entertained in the most desperate case; and, on the other hand, the frequency with which secondary tumours occurred in the internal organs or in distant parts of the body shows that apparently favourable cases may terminate fatally in the course of a few months.

During the correction of the proofs of the foregoing pages, I received a very valuable communication from Dr. Gross, entitled *Sarcoma of the Female Breast*, based upon a study of 156 cases. It is reprinted from the *American Journal of the Medical Sciences* (July 1887), and serves to complete Dr. Gross's work on *Tumors of the Mammary Gland.* Although I venture to differ from the author on the question of the nature and extent of operations for the relief of mammary cancer, I say with pleasure that I regard his monograph on mammary tumours as second to none on this subject, and I am sure that it will long maintain its place as our safest guide to the study of these diseases.

I have not thought it necessary to alter what I have already written on the results of operations for sarcoma, but shall take the liberty of quoting directly the paragraphs which concern us here. Of the 156 cases of sarcoma of the breast, Dr. Gross says that ninety-one were subjected to operation. "Of these, thirty-two were well for periods which varied between one month and ten years and nine months; forty-two were marked by local recurrence; in eight, not only was there regional reproduction, but metastases were found post-mortem; three recurred, with unmistakable evidences of general dissemination; four were characterized by metastases, and two by presumed metastases, without recurrence. In other words, 64.83 per cent. of these cases were endowed with malignant features. Let us examine these general statements more in detail.

"Thirty-two patients were alive and well for an average period of forty-nine months and ten days after operation, the disease having existed, on an average, for sixty-nine months and eleven days before surgical interference, so that the mean life of these subjects was nearly ten years. The period of freedom from recurrence was—

From 1 to 12 months	in 4 cases
,, 1 ,, 2 years	,, 4 ,,
,, 2 ,, 3 ,,	,, 7 ,,
,, 3½ ,, 4 ,,	,, 5 ,,
,, 4 ,, 5 ,,	,, 5 ,,
For 7 years and 3 months	,, 1 case
,, 8 ,,	,, 1 ,,
,, 9 ,, and 11 months	,, 1 ,,
,, 10 ,,	,, 1 ,,
,, 10 ,, and 4 months	,, 1 ,,
,, 10 ,, ,, 5 ,,	,, 1 ,,
,, 10 ,, ,, 9 ,,	,, 1 case."

There are therefore seventeen cases in which the patients were well and free from disease at least three years after operation. The results are certainly better than those exhibited by operations for carcinoma, and this is not to be wondered at; for, in addition to the dangers of local recurrence and of dissemination, which are probably nearly equal for the two diseases, the great danger of affection of the lymphatic glands exists almost alone for carcinoma of the breast.

I may say that Dr. Gross finds that a larger collection of cases of mammary sarcoma confirms in most important points the conclusions he had arrived at from the study of the former collection. Particularly is this so in regard to the very small tendency of the sarcomas to affect the lymphatic glands. He was only able to find evidence of sarcomatous affection of the glands in three of the total number of 156 cases.

Conclusions.—Carcinoma of the breast should be removed at the earliest possible period in suitable cases.

Care should be taken to remove, not only the tumour, but a wide area of the surrounding apparently healthy tissues.

The operation should be free, but adapted to the disease, and the axilla should on no account be opened and cleared of its contents unless there is certainty or a well-grounded suspicion that there is disease of the axillary glands.

Caustics offer no advantage over cutting instruments, so far as the complete removal of the disease (and consequent cure) is concerned; but they may be more safely used than cutting instruments in cases in which the patients are not good subjects for operations.

Removals performed with caustics are much more painful than operations performed with cutting instruments, even if anæsthetics are employed during the first application (of Vienna paste).

If the glands are enlarged, they should be removed when the primary tumour is removed; the prognosis both as regards recovery from the operation and cure of the disease is far less favourable than in the uncomplicated cases.

If the glands become enlarged after the removal of the primary disease, they should be removed, if the removal can be thoroughly and safely effected.

Operations for removal of the glands can be more efficiently performed with cutting instruments than with caustics.

Recurrent disease, whether in the mammary region or in the axilla, should be removed as soon as it appears, provided it is within the reach of removal; the prognosis is far more grave than for the removal of the primary disease so far as *cure* of the disease is concerned.

Extensive adhesions to the integument or to the pectoral muscle, and scattered nodules in the skin of the mammary region, contra-indicate operation; the same may be said of affection of the glands very high up in the axilla forming an immovable mass, and of affection of the glands in the infra-clavicular and supra-clavicular regions.

Even in cases in which there are diseased glands which are not within the reach of operation, the primary disease may sometimes be removed with advantage to the patient on account of ulceration or extreme pain.

Withered scirrhous cancers are not favourable for removal. The disease almost invariably recurs, whereas, if left to itself, it may pursue a very slow course, and may last for years without producing great local discomfort or death.

Sarcomas should be dealt with as freely as carcinomas.

If, at the first removal, only the tumour has been removed on account of its thorough encapsulation and resemblance to an innocent tumour, the recurrent disease should be removed together with a wide area of the surrounding tissues; in fact, the removal should be performed as thoroughly as for carcinoma.

Recurrent disease should be removed as soon as it appears, and the operation should be repeated as often as it is necessary, provided there is no sign of secondary disease.

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